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The Cherokee Springs Meteorite

By STUART H. PERRY

On July 1, 1933, at about 9:42 A.M., a detonating meteor passed over Rutherford county, North Carolina, and Spartanburg county, South Carolina, from which two meteorites were recovered in the latter county. They fell, close to observers, about 6½ miles apart.

The larger mass, weighing about 12 pounds, fell at the village of Cherokee Springs, about 12 miles north-northeast of Spartanburg, South Carolina, and about the same distance south of the North Carolina state line. The other stone, about half as large, fell on the farm of E. P. Cash about four miles from Chesnee, South Carolina. The farm is near what is known as the Bush Creek church, and according to local information is 6½ miles north by east from Cherokee Springs. The region is a somewhat rolling farming country about twenty miles southeast of the Appalachian mountains.

The fall of the larger stone is described as follows by G. E. Mayfield, the proprietor of a store at Cherokee Springs:

> The morning of July 1 I was sitting on the porch of the store talking with Arthur Swafford. We heard a noise like an airplane and for two or three minutes the approach sounded nearer. Finally we went to the edge of the porch to look for the plane, and as I caught around the post at the corner of the porch it sounded as if the plane was just over the building.
>
> On looking for it to come into view I caught sight of the meteorite just as it struck the limb of a hickory tree, to the rear and to one side of the Methodist church, and strike the ground. As soon as it struck the sound died away. It went into the ground, which was sandy, about 15 to 18 inches, then bounced out and was lying 15 inches from the hole it made.
>
> I hurried to the spot and picked it up, but found it was so hot that I had to change it from one hand to the other to keep it from hurting my hands. It fell in a grove of trees. It struck a hickory limb about three-quarters of an inch in diameter and cut it off as if cut by shears. The leaves from the tree fluttering down showed us to the spot.
>
> When we first heard it, the noise was like a plane with the motor racing, but the nearer it came the slower it turned and just before it struck the ground it sounded like a plane with the motor idling.
>
> As nearly as we could determine, after the excitement was over, the time was about 9:42 A.M. The weather was fine, the sun shining, and it was clear with just a few small clouds in sight.

Mr. Mayfield's statement that the noise was audible "two or three minutes" prompted a request to him for a more definite estimate, to which he made the following circumstantial reply:

> In regard to the time it was heard before it struck the ground, I am sure that it was fully two minutes, as we were talking and mentioned the fact.
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> In front of the store, but some distance from the road, a Mrs. Davis was picking figs. We looked for the airplane, as we thought it was, and

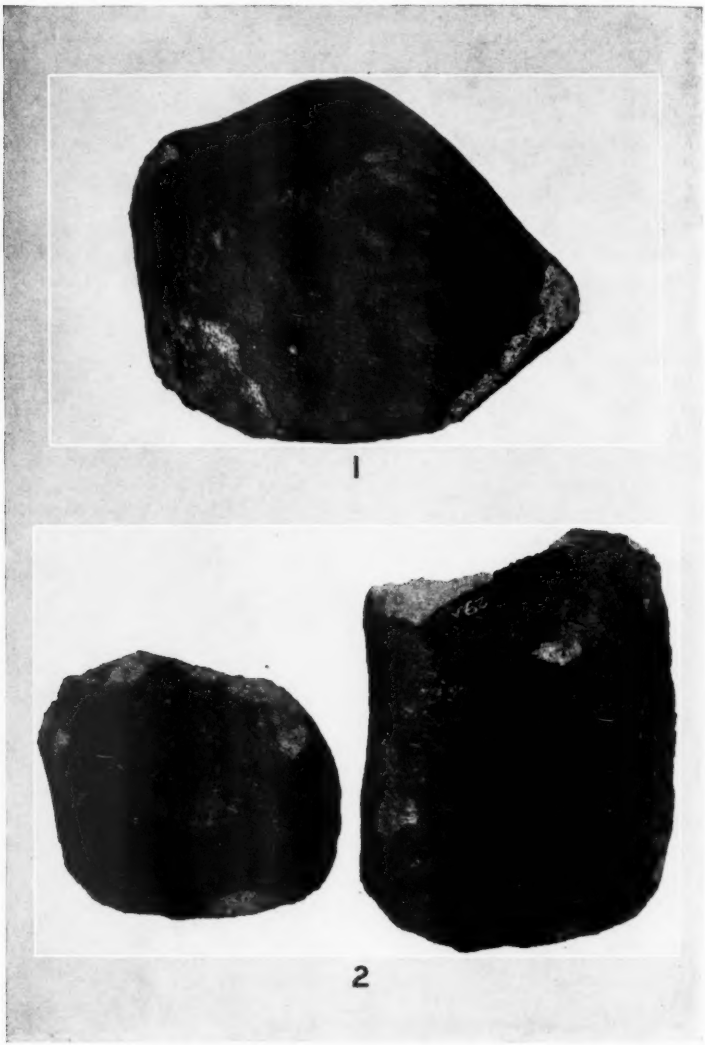

FIG. 1. Base (rear side) of the larger stone showing shallow pitting.
FIG. 2. The two stones placed upright on their bases.

noticed Mrs. Davis come from under the fig bush and look in the northwestern direction, from which it seemed to be approaching. She looked for almost a minute and went back to picking figs.

It seemed to be getting nearer, so I got up and went to the edge of

the porch and looked for it, and turned to Mr. Swafford saying "I don't see it." He got up and came to the edge of the porch. I caught around the post and was looking in the direction it seemed to be coming from, when I saw it hit the limb and turn over two or three times before it struck the ground.

The above estimate of the duration of the sound is in substantial agreement with the statement of Robert Johnson, who was working in the church cemetery about 300 feet from where the stone fell. He writes:

I saw it in the air about 300 feet above me. It was moving at high speed and coming downward. It left a little blue smoke behind it. The noise sounded like an airplane when I first heard it until it got closer; then it sounded like a stone whizzing, as if someone had thrown it. I could hear it "frying" as if it was hot. I estimate that between the time I first heard it and the falling was about a minute and a half.

Miss Agnes Painter, another nearby observer, relates the occurrences as follows:

First I heard a report that sounded like a blast, or thunder, in the northwest. Then in a few seconds I heard the noise which I thought was an airplane speeding down to earth. It sounded like a plane in trouble. I ran to the front yard, expecting to find a plane falling in the yard. I looked up and around but could see no plane, yet I heard the noise over the grove in front of the house.

Rushing over there, expecting to find a smashed plane, I only saw the stone which had fallen, making a hole in the ground two feet deep. When I had the stone in my hands it was most hot enough to burn me, a few minutes after it fell.

I was about 75 feet from where it struck. It passed over the house and fell about 75 feet in front of the house in the grove. I did not see it fall, but by the path made by the stone in falling through the trees it seemed to be moving southeast.

She estimated that it was "about three to five seconds" from the time she first heard the noise until the stone struck the earth; but from her narrative of what she did it is obvious that the time must have been much longer.

Newspaper reporters from Spartanburg reported that the stone was still warm when they arrived at 10:25 A.M.

The fall of the smaller stone was witnessed at even closer range. Mrs. E. P. Cash, who was only fifty feet from where it struck, describes the occurrence as follows:

On the morning of July 1 my husband called me from the field down below the house to bring him some peas. When I reached the barn to get the peas I heard something like a blast, but it sounded like it was way up in the elements. It was to the north. It made me feel queer. I started to go back to the house for my little girl, but I didn't; I picked up the peas and started, and my husband's brother (E. H. Cash) was coming to meet me.

I heard something in the air like an airplane. I looked. He had his hat off and was looking. It was cloudy. I saw something, still thinking it was an airplane real high in the air. By the time I saw it, it came over my head and fell at the corner of our lot fence, made a hole in the ground four or five inches deep, and bounced out on top of the ground. It fell ten feet from our barn.

I was so scared I did not go to it. I went to the house to the children. My husband's brother came and was hunting for it. He picked it

> up. My husband hollered for us not to go to it. I was kind of getting over my scare, and I told him it was at the corner of the lot fence. He picked it up. It was warm. I don't know how long it was before he picked it up, but it wasn't but a few minutes. No one saw it except myself; my husband and son heard and knew it fell close to me but did not see it.

Numerous inquiries in both localities brought no information of any other meteorites having been found, although for months afterwards people in the vicinity searched for them and many curious stones were picked up in the belief that they might have fallen. It is possible that smaller pieces may have fallen somewhere northward of the spot where the smaller stone fell. The larger stone, which naturally would carry farthest, marked the end of the flight because all observers around Cherokee Springs reported that the whizzing sound ceased when it struck the earth. If any other stone had fallen farther to the south it probably would have been still larger and its noise would have been heard.

All the above observers, and numerous others, likened the sound they heard to that of an airplane. The detonations, likened to the sound of blasting, mentioned by Mr. Johnson, Miss Painter, and Mrs. Cash as coming from the north or west, were also heard by Mrs. Ada Johnson who lives three miles west of Cherokee Springs and who said they seemed to come from a westerly direction. C. B. Whiteside who lives a mile and a half from Cherokee Springs (direction not stated) was reported in a Spartanburg paper as having heard "four cracks that sounded like a blast; then I heard the swish; I thought it was an airplane coming down."

Several persons near Rutherfordton, North Carolina, about twenty miles north by west from Cherokee Springs, told Mr. Mayfield that they heard "three or four explosions high in the air, and at that time they heard the noise begin which resembled an airplane."

A fair inference from the positions and reports of the various observers would be that as many as three or four detonations took place, of which two were loud enough to be heard at Cherokee Springs, and that the flight of the meteor was approximately from north-northwest to south-southeast.

Inquiries addressed to local newspapers in all cities and villages in the half-dozen counties to the north and northwest of Rutherfordton brought no reports of anyone having heard any such noises, which would indicate that the source of the detonations was probably in the vicinity of Rutherfordton.

The larger stone when obtained by the writer weighed about 5.7 kg. A portion had been broken from one end when it struck, as related by the finder, and later some small fragments were broken off at that spot by unknown persons. The total material lost, however, could hardly have exceeded 300 grams.

The form of the mass is that of a somewhat flattened five-sided prism 18 cm long with transverse diameters of about 15 and 10 cm. Though

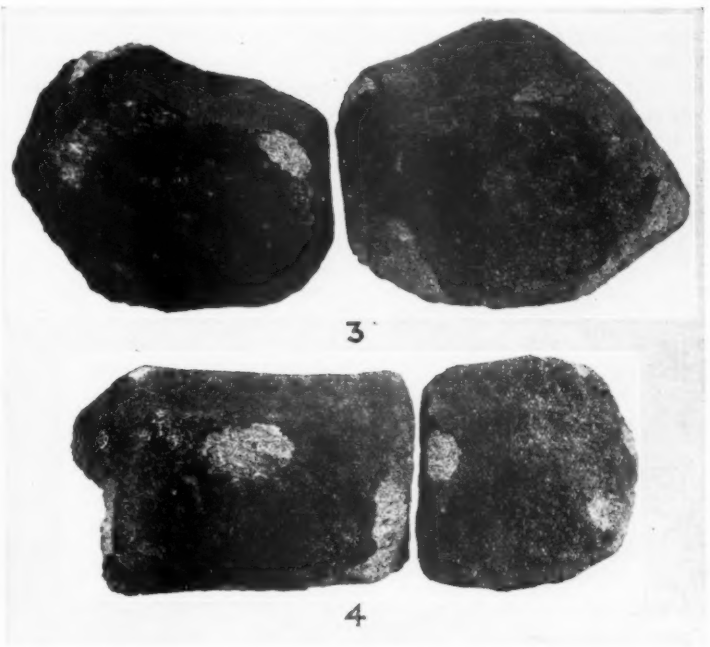

FIG. 3. Bases of the two stones: the larger one at the right.
FIG. 4. The two stones with their bases placed together.

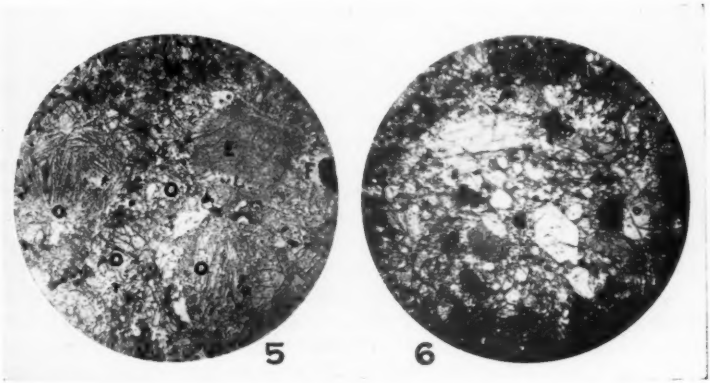

FIG. 5. Field showing three chondrules. O, olivine; E, enstatite; F, feldspar. x 20, plane light.
FIG. 6. Olivine crystals in granular olivine. x 40, crossed Nicols.

the sides are not perfectly flat, the general shape is distinctly that of a prism, with the sides measuring approximately 6, 8, 8, 9, and 9 cm in width. The base has a flat undulatory surface, the mass standing vertically on that end. The original form of the other end was rounded with a flat apex, a small remnant of which remains.

The entire surface, except the broken spot mentioned, is covered with a black primary crust, which near the apical end is crazed with a coarse reticulation. In some places the crust reaches the thickness of a millimeter, but generally it is thinner. In seven or eight places, on edges or at corners, small areas of secondary crust appear.

The sides present an even surface and a smooth crust, with no projections or noticeable roughness, and with no traces of pitting. The base, however, is conspicuously different in appearance, being evenly covered with very shallow pits. The crust on that face is thick, a deeper black, and scoriaceous. Its surface presents a curdled or finely vermiculated appearance, with here and there small irregular areas or islands with a smoother surface.

When the smaller stone, which weighs about 2.7 kg, was obtained at a later date the similarity of the two was so striking as to suggest at once the probability that they are the broken parts of a single original mass. Like the larger stone, it is prismatic in cross-section, the sides smoothly crusted, with a flat base having practically the same form and dimensions and with the same peculiar characteristics. The similarity of the bases and sides is clearly seen in the illustrations. The two bases do not fit each other perfectly, but so nearly that they might easily be cemented together.

The height of the smaller stone when standing on its base is about 11 cm. The apical end does not give clear indications of its original shape, as in the case of the larger stone, because a fairly large piece was broken off in flight; but the slope of the remaining unbroken surfaces would indicate that perhaps five centimeters of its length had been lost, and that the end was originally of a rounded pyramidal or wedge shape.

The large piece separated in flight left an area of dark brown secondary crust about 7 by 12 cm. One of the sides of the prism has been similarly broken, leaving a flat area of secondary crust about 6 by 10 cm. Still another irregular area of secondary crust appears where the edge of the base had been broken away, and four or five smaller areas where chips had been broken from edges and corners. Two or three of the smaller spots show only a faintly brown scorching, with small bright inclusions of troilite but slightly tarnished. Two small bright, untarnished spots of troilite appear in the heavily crusted base, the crust not having closed over them.

The evidences of orientation are somewhat conflicting, but the general appearance of both masses would suggest that their points were forward in flight after they broke apart.

On the larger stone a remnant of the flat apex shows the fused matter running around an edge onto one of the sides. That side, which is

very smooth, nevertheless shows faint indications of drift crosswise, at right angles to the axis of the prism. On the base the curdled or vermiculated surface is very uniform and gives no evidence of drift in any direction, except for a small rounded protuberance caused by a chondrule which shows fine striations diverging radially from its center, and three small spots where the crust shows signs of drift outward and around the edges of the base.

The sides of the smaller stone are smooth, like those of the larger one, save one on which the crust is a deeper black and somewhat scoriaceous, showing at one point some evidence of drift toward the adjoining smooth side. The base of the smaller stone gives no indications of drift. The primary crust surrounding areas of secondary crust shows sharp, though slightly fused, edges which are not indicative of any special position in flight. Both bases have fairly sharp edges, from which numerous chips were broken away in flight leaving small areas of light secondary crust.

On the whole, the surface characteristics would be consistent with the hypothesis that the apex of the larger stone was the front of the original mass before disruption, that afterwards the freshly broken surfaces forming the bases of the two pieces were for a time rearmost, but that both pieces may have occupied other positions during a portion of their flight. The appearance of uniform shallow pitting on the two bases might be due to an uneven fractured surface, later encrusted, rather than to the usual process of erosion by atmospheric friction and heat.

The material of the two stones is identical. The freshly broken surface is light gray and shows a coarse chondritic structure strongly developed, the chondrules mostly not breaking with the matrix. Many of them are as large as peas, and two were observed with diameters of 10 or 12 mm. Troilite occurs rather abundantly in irregular brilliant masses up to 5 mm in size and granules of nickel-iron, often fairly large, are scattered throughout the mass. No indication of veins or fissures was observed.

The chondrules are mostly spherical, ovoid, or rounded, rarely of irregular or angular outlines, and varying widely in size and composition. (Fig. 5). The majority of the chondrules consist of olivine in a wide variety of forms, a number of which are shown in the photomicrographs. In Figure 6 euhedral crystals are shown in a chondrule of granular olivine. Figure 7 shows a chondrule composed of barred crystals in lath-like form variously oriented, and one in Figure 5 exhibits a similar structure. In Figure 8 the olivine appears as crystalline grains in an anorthite base. It also appears as skeleton crystals including anorthite, and as granular aggregates. Occasionally residual glass is included, which appears in tufted forms in Figure 9.

Enstatite is abundant and in its usual characteristic forms. It is conspicuous in round or oval chondrules in which the fibres are eccentrically radiating, or in sheaved groups of which an example is shown in Fig-

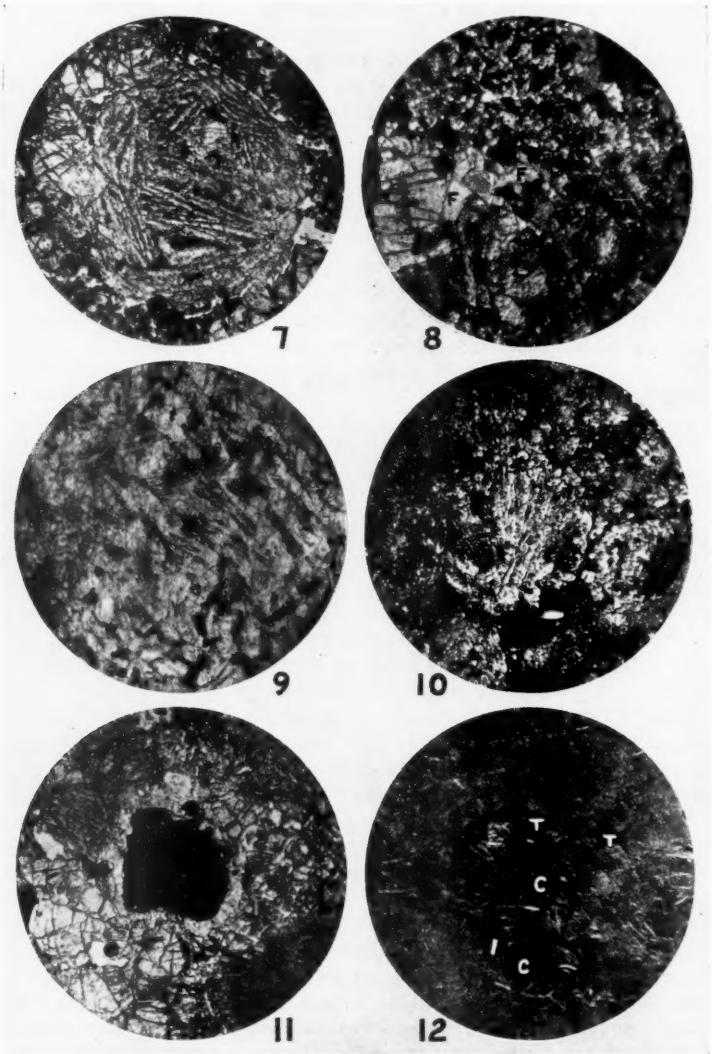

FIG. 7. Several groups of barred olivine crystals in a chondrule. x 40, plane light.
FIG. 8. Crystalline grains of olivine in anorthite base (F). x 150, crossed Nicols.
FIG. 9. Tufts of included residual glass in olivine crystal. x 40, plane light.
FIG. 10. Enstatite with sheaved group of radiating fibers. x 40, crossed Nicols.
FIG. 11. Grain of iron surrounded by feldspar. x 40, plane light.
FIG. 12. Metallic iron (I), troilite (T), and chromite (C). x 40, reflected light.

ure 10. It also occurs in the form of monosomatic crystals and crystal grains.

The following observations on the mineral constituents are made by Mr. W. Harold Tomlinson:

> There is roughly about twice as much olivine as pyroxene. The principal pyroxene present is enstatite. Most of the enstatite chondrules are composed entirely of that mineral, though some contain also small amounts of olivine and anorthite. There is also present a clino-pyroxene of the general form of enstatite which has been called clino-enstatite, and a clino-pyroxene in crystalline grains of the type of diopside.
>
> In addition to the silicates of the olivine and pyroxene groups there is a small amount of plagioclase having about the indices of anorthite. The mineral is unevenly distributed, occurring in some chondrules and not in others.
>
> The amount of metallic minerals is small, not more than 6 to 8 percent. Troilite is most abundant; iron and chromite in about equal proportions. Spherical chondrules having rather perfect crystals of olivine in a granular base, and practically no iron, are rather characteristic of the stone.

A grain of iron surrounded by feldspar is shown in Figure 11, while Figure 12 shows inclusions of iron, troilite, and chromite.

An analysis made by Mr. R. Rupert Kountz under the direction of Professor Louis Waldbauer of the University of Iowa gave the following results:

SiO_2	24.55
Fe_2O_3	40.03
Al_2O_3	12.19
NiO	15.40
CaO	1.43
MgO	5.17
Na_2O, K_2O	1.23
	100.00

The unusually high percentage of Fe_2O_3 in the analysis is evidently due to the fact that the sample did not fairly represent the average composition of the mass. The absence of sulphur also is probably accounted for by the fact that the sample did not happen to include any of the troilite inclusions.

The name Cherokee Springs has been chosen for the two meteorites here described, both of which are preserved in the writer's collection. Though the village where the larger mass fell appears in the postal directory as Cherokee, it has long borne the name of Cherokee Springs by reason of its mineral waters, which have been known from the earliest times. Inasmuch as the name Cherokee County is attached to another meteorite, the name Cherokee Springs would seem less likely to cause confusion than the name Cherokee alone. The meteorites may be classified as gray chondrite (Cg).

May 2, 1934.

The American Association for the Advancement of Science, Berkeley, California, June 18 to 22, 1934

(Astronomy Section)

By G. B. BLAIR

It is impossible in the space available to give any adequate report of the content of the more than forty-five papers presented at the meetings of the Section, consequently an attempt will be made to present in brief form only those recent developments in astronomy, as indicated in the papers, which seem to the reporter to be of some general interest to the readers of POPULAR ASTRONOMY.

The most of the papers presented at the meeting were naturally from the Mt. Wilson and Lick Observatories and from the Students' Observatory at Berkeley, but the Dominion Observatory, Lowell Observatory, Harvard Observatory, and others were also represented. It is expected that abstracts or complete papers will appear in the *Publications of the Astronomical Society of the Pacific*.

Considerable attention was devoted in a number of papers to the so-called stationary lines in the spectra of the stars due to interstellar calcium and sodium. A paper by Merill of Mt. Wilson indicated that, until recently, only four interstellar lines were known, H and K of ionized calcium and the ordinary D_1 and D_2 lines of sodium. Mt. Wilson observations now add four new interstellar lines at wave lengths 5780.4, 5796.9, 6283.9, and 6613.9 A U. These lines behave like the previously known interstellar lines except that they are not narrow and sharp but somewhat diffuse. Their chemical identifications have not been found. Trumpler of Lick Observatory discussed methods available for determining the distribution of interstellar mass in space. Besides noting the distribution of stars showing the interstellar lines, it has been found possible to compare the intensity distribution in the spectrum of a distant star with that in the spectrum of a star of the same class comparatively near at hand. Distant stars, not too far from the galactic plane, show a selective absorption effect increasing toward the blue end of the spectrum. This is probably due to the scattering of light by small particles distributed through space. This effect, of course, is in general a function of the distance of the star and of the density of the material intervening in space. Recent observations of color indices indicate that distant stars near the galactic plane show considerable color excess (space reddening). The absorption layer is found to be thickest, as a rule, near the galactic plane but thins out in higher galactic latitudes. It, however, shows decided local irregularities.

A paper by Hogg of the Dominion Astrophysical Observatory pre-

sented results tending to confirm earlier conclusions by Cillié of the same observatory that while the nucleus of planetary nebula N.G.C. 2392 is an ordinary O-type star, that of N.G.C. 6826 is a white dwarf. The latter seems to show the Einstein red shift due to great mass as compared with diameter, the shift of the lines of the nucleus being measured with reference to the lines of the surrounding nebula. Investigations by Menzel indicate low intrinsic luminosities for the nuclei of planetaries although the surface brightness comes out very great.

A discussion of Cepheid variables observed by Helen Sawyer of Dominion Observatory in globular cluster Messier 2 adds three Cepheids of period of more than one day to the ten previously found in star clusters.

The nebulosity about Nova Persei No. 2, according to a paper by Humason of Mt. Wilson, has now reached a radius of about 19″. The rate of expansion has been nearly uniform at 0″.4 per year. The parallax of the star based on the rate of expansion since 1917 and the mean radial velocity of expansion is 0″.00158.

Mayall of Lick Observatory observed that the extra-galactic nebula N.G.C. 4151 shows bright lines due to hydrogen, helium, oxygen, and neon. The interstellar K line shows faintly although the nebula is nearly at right angles to the galactic plane.

On the basis of the study of the spectra of interstellar lines, Langer of Mt. Wilson estimates the ratio of the abundance of sodium to calcium in space as at least 10 to 1, probably 20 to 1.

Sanford, at Mt. Wilson, from 146 stars of Class N, derives for the term rA in the galactic rotation -13.4 ± 2.5 kilometers per sec. Longitude of galactic center 315°.

A paper by Babcock and Babcock of Mt. Wilson discusses the observation of a number of lines in the chromosphere of the sun by the use of very high dispersion which were previously observable only during eclipses. Also, it was pointed out that a number of new absorption lines in the infra-red spectrum of the sun have been obtained on red sensitive plates which have recently become available.

A paper by Nicholson and Sternberg of Mt. Wilson points out that the new sunspot cycle, as indicated by the reversal of polarity of the spots, has now definitely begun. The length of the last cycle is given as 10.3 years.

Evidence presented by Fernando Sanford of Stanford University would indicate that the number of sunspots is greater when the earth and Venus are on opposite sides of the sun than when they are on the same side. The author explains the effect as possibly due to the action of the electric charges of the earth and of Venus upon the photosphere of the sun.

Baade of Mt. Wilson finds from recent observations a magnitude of about 15.58 for the planet Pluto and a color index of +0.67 mag. He

estimates the mass of Pluto as about equal to that of Titan.

A paper by V. M. Slipher of Lowell Observatory and Arthur Adel of the University of Michigan relates the definite confirmation by laboratory experiment at the University of Michigan that the well-known absorption bands in the spectra of the outer planets discovered by Slipher many years ago are due to methane. These bands are comparatively weak in the spectrum of Jupiter but increase in intensity in the order of the distance of the planets from the sun, being very strong in the spectrum of Neptune. In the laboratory experiments, light passed through a thickness of methane equivalent to 2000 meters at atmospheric pressure gave a spectrum intermediate in intensity between that of Jupiter and that of Saturn. Other bands in the spectra of the giant planets have been proven at Mt. Wilson to be due to ammonia. Discussion of the paper brought out the interesting fact that practically all outstanding bands in the spectra of these planets have now been identified. It is pointed out in the paper that planetary spectra may now be photographed to 10500λ by using the newly developed infra-red-sensitive plates.

Those who observed the great white spot on Saturn will be interested to know that, according to E. C. Slipher, it was only one of a series of such spots which developed in the equatorial regions of the planet encompassing almost the entire perimeter. Only one of these spots was a conspicuous one. The surface of the planet was closely examined at Lowell Observatory less than 48 hours before the great white spot was discovered and no sign of its presence was then observed. The great spot behaved very similarly to the great spot observed by Asaph Hall in 1876 and appeared at nearly the same latitude.

Tests of orbits of minor planets computed by Leuschner's method, using the Berkeley tables of perturbations, show a good representation of recent observations after a lapse of time of over two decades.

Walter T. Whitney of Claremont Colleges described a new type of Foucault pendulum the amplitude of which is maintained by slightly shortening and lengthening the suspension wire at the proper points in the swing. This is accomplished automatically by an ingenious electrical device.

Robert Burnside Potter

By RICHARD S. PERKIN

Mr. Robert Burnside Potter of Smithtown, New York, died on May 31, 1934, after a protracted illness.

Mr. Potter was born in New York City on January 29, 1869, attended Groton School, and graduated from Harvard in 1891. After receiving his degree from the Ecole de Beaux Arts in 1900 he returned to New York to practice architecture.

Mr. Potter had for many years an enthusiastic amateur's interest in

things astronomical and in 1911, after retiring from practice, erected an observatory atop his new house at Smithtown, a description of which appeared in POPULAR ASTRONOMY, Vol. XXI, p. 84, February, 1913.

Upon the entrance of the United States into the World War he received from Franklin D. Roosevelt, then Assistant Secretary of the Navy, his appointment as an optical expert to be associated with the Naval Observatory. During this period of service Mr. Potter resided with the late Professor Asaph Hall.

In the years following his return from Washington he devoted his time to the study of asteroid and satellite motions, also the development of various optical accessories for his equipment. His work in these fields was well known and highly regarded by the many astronomers with whom he was in intermittent communication.

Although the study of astronomy and kindred subjects occupied most of his leisure time, Mr. Potter was a poet of considerable ability, a book of his poems being published privately during the past year. His group of astronomical paintings, many of which were made at the eyepiece of the 26-inch at Washington, were works of art, beautifully executed and scientifically correct.

The societies in which he held membership included the American Astronomical Society, of which he was a life member, The Astronomical Society of the Pacific, The British Astronomical Society, and the Société Astronomique de France.

With the passing of Mr. Potter, astronomy has lost a devoted student, a master observer, and a gentleman who exemplified the highest attributes of the science.

Astronomy and Advance in Civilization

By W. CARL RUFUS

Astronomy is usually considered to be the oldest science. It played a prominent role in primitive culture and has blazed the way during many stages of human progress.

Its first notable contribution was a method of time measurement. The day, the month, and the year were based on the apparent motions of the sun, moon, and stars. The week, the oldest monument of astronomical knowledge, has days named for the seven wandering stars or planets of the ancients: Saturn day, Sun day, Moon day, etc. The chronologies of the ancients, some of which make extravagant claims of antiquity, are based upon astronomical eras or epochs empirically determined, usually beginning with a hypothetical general conjunction of the planets.

Akkadian records from the reign of Sargon (3800 B.C.) give evidence of earlier observations of the stars. The great cuneiform library of King Assurbanipal is said to contain extensive observations of stars

and planets dating from 2700 B.C. The Chaldeans determined the periods of revolution of the planets, and the periodic recurrence of many astronomical events such as planetary conjunctions. They established the Saros, a time period used to predict eclipses. Two Chinese royal astronomers, Hi and Ho, over 2000 years B.C., lost their lives because they failed to predict a solar eclipse.

The twelve zodiacal constellations, and the twenty-eight lunar mansions, were invented to mark the progress of the heavenly bodies by the watchers of the sky. Soon they became the abode of supernatural powers. Men worshipped the sun, bowed to Venus, and prayed to the Pleiades for rain. Temples were erected to heaven, altars to the earth, shrines to the seven stars, and spirit houses to constellations and divisions of the sky. The soul of primitive man was quickened by a cosmic consciousness which bound him in mystic union with the unattainable great Beyond symbolized by sun and stars. Thus the heavenly bodies became potent in their influence in human affairs. Astrology obtained a grip on the human mind that held sway until the seventeenth century and is not yet entirely extinct. We speak of men as saturnine, jovial, martial. We use many words like ascendency, aspect, contemplate. Astrologers in some countries became the priestly class and dominated the primitive religions of mankind. Ancient art, music, and literature owe much to the inspiration of the heavenly bodies. The oldest extant poem of the world, found among the Pyramid texts, "The Ritual of the Dead," is a beautiful ode to the rising and setting sun.

The Babylonians developed a better method of celestial measurements including the sexagesimal system still used in time and circular measure, and obtained more nearly accurate observations than their predecessors and contemporaries.

The astronomical records of the ancients provided the raw material used by the Greeks to found the science of astronomy. Perhaps more important was their inherited confidence in the recurrence of astronomical events, the order of the heavens, the faithfulness of the stars. That doctrine seems equivalent to the modern assumption of uniformity of nature, which is the basis of scientific thought. But we owe much to the Greeks. In the East the priests monopolized knowledge, insulated it from the people by the occultation of magic, divination, and astrological formulae. The Greeks freed the intellect. Reason and imagination began to assert themselves. They loved knowledge, peered into the occult and obscure, trusted the conclusions of reason, and learned first of all from the heavenly bodies that nature works by definite laws. They classified astronomical phenomena and sought to explain by mathematical formulae. Thus the science of astronomy began.

Plato set the problem for his disciples to reduce the motions of the heavenly bodies to mathematical law. Eudoxus proposed the first geocentric theory and introduced the scientific method by applying his theory to observations made in his own observatory. Aristarchus ad-

vocated a heliocentric theory, which was rejected by Aristotle because he imagined that a moving earth would certainly lose its flying birds and probably all its humans. He also held correctly that if the earth moved around the sun the stars would show annual parallax, or change of direction. This was not observed by the Greeks. So the geocentric system with its ingenious cycles and epicycles was adopted and held sway nearly two thousand years.

But Greek science met a natural death, largely due to its lack of sufficient emphasis on observations. The constructive period of Greek science was followed by an apparently stationary period in Europe that lasted nearly a thousand years. The Syntaxis of Ptolemy, the great astronomical classic, was preserved by the Arabs who translated it and called it the "Almagest," *i.e.* the Greatest. The Revival of Astronomy in Europe paved the way for rapid advance in civilization. Astronomy was the only subject of the thirteenth century that possessed the essentials of a science, among which are instruments of observation, a system of measurements of phenomena, and a theory to which to apply the data. Instruments of precision were largely the work of the practical astronomer. Tables were prepared which enabled the Phoenicians and other mariners to leave the coast and sail the open sea. Regiomontanus in his observatory at Nuremberg in 1490 prepared tables probably used by Columbus on his voyage of discovery. Columbus also held the astronomical doctrine of sphericity of the earth and its relative smallness, and thus believed that he could reach the east by sailing west. When the compass failed and his sailors were mutinous his confidence in the faithful stars held him to his course.

Astronomy thus provided a standard of direction for mariners at sea and for caravans on the trackless desert. It has remained indispensable for independent determination of position on sea or land or in the air, and so is fundamental in navigation, geodesy, and aviation. Cartography owes its inception and modern perfection to practical astronomy. Exploration and discovery, from the urge of the Norsemen to the modern polar adventurers, were guided by the stars. Magellan rounding the southern cape exclaimed, "I feel exposed to infinity."

The sixteenth century began one of the greatest periods in the history of science. Copernicus changed the center of planetary motion from the earth to the sun. The instruments of Tycho Brahe gave better data. Galileo contributed the telescope and some correct laws of dynamics. Kepler established his three empirical laws of planetary motion, the ellipse, constant areal velocity, and the harmonic law. Newton completed this inductive period and rationalized Kepler's laws by his great generalization, the law of gravitation, the first great physical synthesis. The international nature of this inductive period is interesting. Copernicus was a Pole, Tycho Brahe a Dane, Galileo an Italian, Kepler a German, and Newton an Englishman. Einstein's recent work incorporates Newton's law in a broader generalization, thus adding the

name of a Jew now in America to expand the world-wide significance of the list of contributors to a single problem of science.

The overthrow of the geocentric theory wrought a great revolution in human thought. Medieval science was stagnant, blindly accepting the authority of Aristotle and the ancients. Galileo boldly challenged that authority. Aristotle had thought that bodies fall according to their weight. Galileo proposed to put it to experimental test. At the Leaning Tower of Pisa, before assembled citizens, faculties, and students, he dropped two balls of the same size but of different weight, one of wood and one of iron, and they fell side by side. Thus he disproved the erroneous ideas of the Greeks and established correct laws of motion. He also adopted the Copernican doctrine that the earth moves around the sun, which was contrary to orthodox ecclesiastical teaching. So he was tried and made to recant. The church seemed to associate the geocentric idea with the anthropocentric doctrine in religion. Tycho Brahe invented his ingenious compromise, that the sun moved about the earth which was stationary, while all the other planets revolved about the sun. This explained the phenomena and avoided the raging controversy. But the telescope of Galileo revealed satellites revolving about Jupiter. The unchangeableness of the heavens was violated. Spots were seen on the sun with the aid of the telescope, which some refused to use. Mountains were revealed on the moon. And one of the scientific objections to the Copernican theory was removed,—Venus showed phases like the moon. Arisotle's objection that the stars should show annual parallax was not met until near the middle of the nineteenth century. Thus science through astronomy won its first great conflict, not with religion as is sometimes falsely stated, but with ecclesiastics, who attempted to uphold an antiquated erroneous doctrine.

Along general cultural lines difficult to evaluate are some of the most important contributions of astronomy to civilization. Scientific astronomy has aided in overthrowing the absurdities of astrology and the superstitions regarding eclipses, comets, new stars, etc., which are not portents of evil or omens of war, pestilence, and famine, but natural phenomena to be studied and explained by natural law. Thus it helped to rid the world of evil spirits and was more effective than the red-hot needle of the sorcerer, or the water cure and other tortures applied in witchcraft. It helps man to understand nature: frequently its laws, like the law of gravitation, proved first for great masses, are then found to apply elsewhere. Its problems provide incentive in other fields of knowledge. Newton invented fluxions, a geometrical form of the infinitesimal calculus, to solve a problem in astronomy. Helium was discovered by its lines in the spectrum of the sun a quarter of a century before it was captured in small quantities on the earth. Now it fills many lighter-than-air machines. Nebulium, found in the nebulae, gave physicists a fruitful subject of research recently successful, when it was identified as ionized oxygen and nitrogen, two elements most abundant

in the atmosphere of the earth. Coronium, found only in the spectrum of the sun's corona, still challenges the contraptions of the laboratory.

Astronomy aids man in finding his place in the universe, and sometimes makes him feel very small and humble by comparison. It has promoted the idea of gradual development or evolution. Laplace's evolution of the solar system was old before biological evoluion was born. It extends its laws to distant stars and gives evidence of the unity of the universe. It analyzes the light of sun and stars and nebulae, and proves that these bodies are composed of the same elements as the food we eat and the air we breathe. It photographs the spectra of celestial objects for data not obtainable in the laboratory to aid the scientist in his study of the structure of matter. It provides the astronomical model of the atom with its positive nucleus and revolving planetary electrons. It catches the radiant energy of the orbs of space and gives us the only information that comes to earth from the universe outside. Our ideas of space and time must conform to its requirements. The new space-time universe of Einstein submits to its crucial tests.

More amazing is the interlocking of the energy within the atom and the velocity of spiral universes millions of light years distant. Eddington in "The Expanding Universe" makes the astounding statement: "Hope of progress in our understanding of electrons, protons, and quanta is bound up with the investigation of the motions of remote galaxies."

So from the primitive cult of the cave man to the most modern scientific doctrine, astronomy has made important contributions. With more powerful instruments now in process of construction it faces the future with the ardent spirit of the pioneer of progress.

Planet Notes for September and October, 1934

By CLIFFORD E. SMITH

The *Sun* will be moving southeast from the central part of Leo to the eastern part of Virgo. It will be at the Autumnal Equinox on September 23 at $11^h\,46^m$ A.M., C.S.T., and this instant marks the beginning of fall. At the beginning of September the distance from the earth to the sun will be about 93.7 million miles, and this distance will decrease to about 92.2 million miles by the end of October. The position of the sun on September 1, October 1, and October 31 will be, respectively: R.A. $10^h\,38^m$, Decl. $+8°\,37'$; R.A. $12^h\,26^m$, Decl. $-2°\,50'$; and R.A. $14^h\,18^m$, Decl. $-13°\,49'$.

The phenomena of the *Moon* will occur as follows:

New Moon	Sept.	8 at	6 P.M.	C.S.T.
First Quarter		16 "	6 A.M.	"
Full Moon		22 "	10 P.M.	"
Last Quarter		30 "	6 A.M.	"
New Moon	Oct.	8 "	9 A.M.	"
First Quarter		15 "	1 P.M.	"
Full Moon		22 "	9 A.M.	"
Last Quarter		30 "	2 A.M.	"

Apogee	Sept. 4	"	12 P.M.	"
"	Oct. 2	"	4 P.M.	"
Perigee	Sept. 20	"	7 P.M.	"
"	Oct. 18	"	8 A.M.	"

Mercury will be an evening object, and its apparent motion will be from eastern Leo, across Virgo, to western Libra. Its distance from the earth will decrease from about 130 million miles to about 60 million miles. The corresponding change in apparent diameter will be from about 5 to about 10 seconds of arc. The best time for observation will be near the tenth of October, since, on that date, at 4:00 P.M., C.S.T., it will be at greatest elongation east (25° 13'), and thus, it will set about an hour and a half after the sun. The position of Mercury on October 1 will be R.A. $13^h\ 51^m$, Decl. —13° 25'. Conjunction with the moon will occur at noon, C.S.T., October 10 (Mercury 2°.2 N), and on September 10 at 2:00 A.M., C.S.T. (Mercury 5°.2 N). Also on September 29 at 7:00 A.M., C.S.T., Mercury will be in conjunction with Jupiter (Mercury 3°.0 S).

Venus will be a morning object, and its apparent motion will be from western Leo to eastern Virgo. Its distance from the earth, during this period, will be about 150 million miles, and its apparent diameter will be about 10 seconds of arc. During the middle of this period it will rise about an hour before the sun. Conjunction with the moon will occur on September 7 at 4:00 A.M., C.S.T., and on October 7 at 4:00 P.M., C.S.T. (Venus 2°.6 N and 6°.2 N, respectively). At midnight on September 20, C.S.T., there will be a conjunction of Venus with Neptune (Venus 30 minutes of arc north).

Mars will be a morning object at a distance of about 200 million miles from the earth, and having an apparent diameter of about 4.5 seconds of arc. During September it will be in Cancer and it will rise about three hours before the sun; during October it will be in Leo, and it will rise about four hours before the sun. On September 5 at 6:00 A.M., C.S.T., there will be a rather close conjunction with the moon (Mars 29 minutes of arc north), and on October 4 at 4:00 A.M., C.S.T., there will be a second conjunction with the moon (Mars 2°.7 N).

Jupiter will be too near the sun to be of interest during this period. Early in September it will set about two and a half hours after the sun, but it will approach the sun rapidly in apparent position, so that conjunction with the sun will occur on October 27 at 10:00 A.M., C.S.T. It will be in the constellation Virgo during this period.

Saturn will be an evening object in eastern Capricornus, and, during the middle of the period, it will be on the meridian about 9:00 P.M., Standard Time. Its distance from the earth will be about 850 million miles and its apparent diameter will be about 16 seconds of arc. Its apparent motion among the stars will be in a southwesterly direction. Conjunction with the moon will occur at noon C.S.T., on September 20, and at 6:00 P.M., C.S.T., October 17 (Saturn 2°.9 S).

Uranus will be a night object in western Aries. Since opposition will occur on October 23 at 7:00 A.M., C.S.T., Uranus will be above the horizon most of the night hours. Its distance from the earth will be about 1800 million miles, and its apparent diameter will be about 3.6 seconds of arc. Conjunction with the moon will occur on September 25 at 6:00 A.M., C.S.T., and on October 22 at 2:00 P.M., C.S.T. (Uranus 6°.0 S).

Neptune will be in southeastern Leo near χ Leonis, and, during the latter part of this period, it will be a morning object rising about three hours before the sun.

Its distance from the earth will be about 2800 million miles; its apparent diameter will be about 2.4 seconds of arc. During the first part of this period it will be near the sun in apparent position. Conjunction with the sun will occur on September 5 at 4:00 A.M., C.S.T. The position of Neptune on October 30 will be R.A. $11^h\ 2^m$, Decl. $+7°\ 10'$.

OCCULTATION PREDICTIONS

(Taken from the *American Ephemeris.*)

The quantities in the columns *a* and *b* are given for the purpose of making these predictions useful for any place within 200 miles of the point indicated. The procedure is as follows: Subtract the longitude of the point given from the longitude of the place in question; multiply the result, taking the signs into ac-

OCCULTATIONS VISIBLE IN LONGITUDE $+72°\ 30'$, LATITUDE $+42°\ 30'$.

Date 1934		Star	Mag.	IMMERSION Greenwich C.T. h m	*a* m	*b* m	Angle E from N °	EMERSION Greenwich C.T. h m	*a* m	*b* m	Angle E from N °
Sept.	4	B.D.+23°1744	6.4	7 13.5	..	..	166	7 33.8	..	..	205
	14	π Sco	3.0	23 51.6	—1.0	—0.3	53	0 47.5	—1.5	—2.3	317
	18	336 B.Sgr	6.5	21 51.0	—1.2	+1.0	102	22 54.4	—1.5	+1.5	225
	19	21 Cap	6.5	21 19.7	—0.9	+2.6	21	22 1.2	—0.7	+0.6	301
	19	19 θ Cap	4.2	23 41.0	—1.4	+1.4	61	0 55.3	—1.6	+0.9	245
	21	252 B.Aqr	5.8	23 7.2	—0.6	+1.6	82	0 5.0	—0.7	+1.9	218
	22	197 G.Aqr	6.3	0 18.8	—1.5	+0.9	110	0 58.0	—0.3	+2.6	183
	25	101 Psc	6.2	0 53.7	+0.3	+2.2	21	1 38.1	—0.7	+1.1	282
	27	16 Tau	5.4	11 37.9	—0.8	—2.3	118	12 36.9	—1.1	0.0	231
	28	χ Tau	5.3	1 50.5	+1.3	+2.7	12	2 14.0	—0.7	—0.1	319
Oct.	1	48 Gem	5.8	4 37.2	+0.7	+2.2	54	5 22.8	—0.5	+0.1	312
	13	163 G.Oph	6.3	22 3.2	..	..	144	22 41.9	..	..	202
	23	ϵ Ari	4.6	23 10.7	+0.4	+1.6	62	0 4.4	0.0	+1.5	254
	27	139 Tau	4.7	3 24.5	—0.8	+0.7	116	4 22.3	—0.3	+2.4	234
	28	ω Gem	5.2	9 38.2	—1.7	—1.8	126	11 1.9	—2.0	—0.9	271

OCCULTATIONS VISIBLE IN LONGITUDE $+91°\ 0'$, LATITUDE $+40°\ 0'$.

Sept.	6	π Cnc	5.6	10 36.0	—0.8	—2.2	165	11 11.9	—0.1	+3.7	231
	14	π Sco	3.0	23 20.8	—2.1	+0.5	54	0 19.2	—2.0	—2.1	326
	18	ψ Sgr	4.8	4 51.6	..	..	137	5 15.1	..	..	179
	19	θ Cap	4.2	23 15.4	—1.0	+1.7	62	0 23.8	—1.3	+1.3	255
	21	150 B.Aqr	6.0	8 21.3	—0.8	—1.1	88	9 12.8	0.0	+0.7	209
	21	197 G.Aqr	6.3	23 59.6	—0.5	+1.1	103	0 43.8	—0.4	+2.4	198
	25	101 Psc	6.2	0 56.3	+0.6	+2.4	8	1 25.9	—0.3	+0.6	300
	27	q Tau	4.3	11 23.7	—1.7	—1.1	97	12 41.2	—1.5	—0.3	247
	27	16 Tau	5.4	11 25.4	..	..	143	12 3.7	..	..	198
	27	21 Tau	5.8	11 49.2	—1.6	—0.7	83	13 6.4	—1.1	—1.0	263
	27	22 Tau	6.5	11 54.2	—1.5	—1.0	90	13 10.3	—1.2	—0.8	256
	27	20 Tau	4.1	11 54.8	—1.3	—3.1	128	12 50.0	—1.7	+1.3	217
	29	112 B.Aur	5.7	11 2.5	—2.4	+3.4	42	11 59.8	—1.8	—4.0	324
Oct.	4	18 Leo	5.8	10 12.1	—0.7	+0.8	107	11 23.9	—1.1	0.0	303
	4	19 Leo	6.4	11 1.1	—1.0	—0.4	133	12 16.6	—1.5	+0.6	281
	4	R Leo	5-10	11 24.7	—0.9	—2.3	163	12 21.5	—1.9	+2.3	252
	12	134 B.Sco	6.4	23 8.6	—1.9	—1.2	114	0 18.6	—1.0	—0.6	245
	14	X Sgr	4.4	0 1.7	..	..	156	0 20.3	..	..	184
	17	19 Cap	5.7	3 28.3	—2.1	—1.6	107	4 14.3	+2.0	+1.6	190
	20	λ Psc	4.6	8 18.2	—0.6	—1.3	90	9 10.6	—0.2	+0.7	213
	25	χ Tau	5.3	13 16.8	—0.7	—0.4	60	14 8.2	+0.4	—2.1	303
	27	139 Tau	4.7	3 16.6	+0.1	+1.1	97	4 14.1	0.0	+1.6	251
	28	ω Gem	5.2	9 8.4	—2.0	—2.7	147	10 15.6	—2.6	+2.3	238

Occultations Visible in Longitude +120° 0′, Latitude +36° 0′.

Sept.	4	187	B.Gem	6.3	10	56.8	..	..	19	11	10.8	..	..	353
	15	65	B.Sco	5.5	4	0.8	—0.3	+0.5	39	4	44.6	—1.7	—2.9	323
	18	ψ	Sgr	4.8	3	51.8	—2.1	—0.1	87	5	7.1	—1.3	+0.3	231
	12	134	B.Sco	6.4	23	8.6	—1.9	—1.2	114	0	18.6	—1.1	—0.6	245
	27	16	Tau	5.4	10	16.1	..	..	134	10	55.9	..	..	187
	27	q	Tau	4.3	10	19.8	—2.4	+0.3	93	11	43.2	—2.0	+1.8	230
	27	21	Tau	5.8	10	48.3	—2.4	+0.4	87	12	16.1	—2.1	+1.1	240
	27	22	Tau	6.5	10	53.9	—2.5	—0.1	95	12	18.4	—2.1	+1.5	232
	27	20	Tau	4.1	10	59.2	..	..	137	11	39.5	..	..	189
	27	18	Tau	5.6	11	16.9	..	..	346	11	20.9	..	..	337
	29	112	B.Aur	5.7	10	7.0	—0.4	+4.1	33	11	0.6	—2.6	—1.7	312
Oct.	4	19	Leo	6.4	10	46.1	—0.2	—0.5	140	11	41.5	—0.3	+1.6	261
	4	R	Leo	5-10	11	15.6	..	..	187	11	31.2	..	..	214
	17	19	Cap	5.7	2	29.7	—1.8	+1.0	61	3	49.9	—1.6	+0.6	236
	20	λ	Psc	4.6	7	45.8	—1.6	—0.1	73	8	53.9	—0.8	+1.0	216
	23	26	Ari	6.2	13	26.5	—0.5	—0.8	78	14	26.3	—0.1	—0.8	258
	25	χ	Tau	5.3	12	51.6	—1.3	—1.6	105	14	4.8	—1.2	—0.6	254
	28	ω	Gem	5.2	8	18.3	—1.7	—1.2	142	9	9.1	—0.6	+3.5	225

count, by the quantity under *a* for the star to be observed; similarly, with the latitude, using *b*; apply the sum of the products, with its proper sign, to the Greenwich C.T., and obtain the predicted Greenwich Civil Time for the phenomenon at the place of observation. To obtain Eastern Standard Time it is necessary to subtract five hours; Central Standard Time, six hours, etc.

Variable Stars

Monthly Report of the American Association of Variable Star Observers for May and June, 1934

It is with deepest regret that we are obliged to announce the sudden death in Java of Miss Harriet W. Bigelow, recently retired president of our Association and head of the department of astronomy at Smith College, Northampton, Massachusetts. Miss Bigelow had long been identified with our Association not only as a wise Council member and efficient officer but also as an ardent variable star observer. Not only did she keep track actively of a well-selected list of stars but she trained, through her excellence as a teacher, others to take up the work. Her last report was submitted in August of last year just before sailing for a world's tour. Her sudden passing will be genuinely felt by many of our Association.

Many observers have contributed to this double report, some of the older members doubtless spurred on to renewed activity as a result of the inspiring Spring meeting held at the Fels Planetarium in Philadelphia late in May. Among the new contributors we cite the following: R. A. Belsham, Miami, Florida; Frank Dieter, Wauwatosa, Wisconsin; J. B. Field, Baltimore, Maryland; W. S. Fish, Jackson Heights, New York; E. A. Halbach, Milwaukee, Wisconsin; J. O. Hassler, Norman, Oklahoma; R. Harper, Kirkwood, Missouri; N. J. Heines, Paterson, New Jersey; R. P. de Kock, Capetown, South Africa; J. C. Lucas, Elmhurst, Long Island, New York; A. L. Peck, Milwaukee, Wisconsin; T. L. Richards, Cumberland, Maryland; C. S. Walton, Denver, Colorado, and H. A. Wilson, Nogales, Arizona.

After a period of slight activity on the part of R Coronae Borealis, particularly during the month of April, that variable now appears to have attained full

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

April 0 = J.D. 2427528; May 0 = J.D. 2427558; June 0 = J.D. 2427589.

J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs.

X AND
001046
500 8.9 Ch
570 10.6 Jo
574 10.8 Jo
577 11.0 Jo
596 11.5 Jo
600 12.0 Jo

T AND
001726
501 7.7 Ch
602 12.1 Pt

T CAS
001755
510 11.3 Ch
562 9.2 Mc
563 10.8 Jo
565 10.1 Hf
571 9.3 Mc
574 10.7 Jo
576 9.8 Ra
581 9.8 Hf
594 9.4 Hf
594 9.7 My
596 9.0 Jo
597 9.7 My
598 8.8 Mc
600 9.3 Jo
602 9.8 My
603 9.1 Jo
607 10.2 Ru

R AND
001838
505 11.0 Ch
548 6.8 Ko
566 7.2 Jo
570 7.0 Jo
574 7.0 Jo
575 6.8 Ko
581 6.9 Hf
594 7.6 Hf
596 7.3 Jo
600 7.6 Jo
602 7.2 Pt

S TUC
001863
509 11.6 Sl
515 12.0 En
536 13.3 Bl

T PHE
002546
534 9.7 Bl
544 9.3 Bl

Y CEP
003179
501 10.5 Ch

U CAS
004047a
515 10.0 En
523 10.1 Sl

U CAS
004047a
532 10.7 Hi
576[12.1 Ra
602[12.6 Pt

— CAS
004047b
602 10.7 Pt

RW AND
004132
503[12.5 Ch
596 9.8 Jo
603 9.6 Jo

V AND
004435
503 11.0 Ch
596 10.4 Jo
603 11.3 Jo

RR AND
004533
503[12.4 Ch
603 11.5 Jo

RV CAS
004746a
503[12.1 Ch

W CAS
004958
453 10.9 Gw
454 10.8 Gw
503 9.7 Ch
513 9.9 Gw
530 9.7 Ko
536 10.0 Gw
544 9.4 Ra
565 9.4 Hf
566 9.1 Jo
568 9.3 Hu
568 9.3 Ar
570 9.0 Jo
574 9.0 Jo
576 9.4 Ra
581 9.4 Hf
587 9.0 Ar
587 8.9 Hu
588 9.0 Gw
594 9.1 My
594 9.4 Hf
596 8.8 Jo
597 9.4 My
600 8.9 Jo
602 9.4 My
602 8.8 Pt
603 8.9 Jo

U TUC
005475
500 8.9 Sl
510 9.1 Sl

U TUC
005475
530 10.0 Ht
534 10.6 Ht
534 10.6 Bl
536 11.1 Sl
539 11.4 Ht
543 11.3 Sl
545 11.4 Ht
547 12.1 Bl
551 12.2 Ht
563 12.8 Ht
568 12.8 Ht

U SCL
010630
536[10.4 Bl

U AND
010940
505[12.1 Ch

UZ AND
011041
505 11.8 Ch

S CAS
011272
500[11.5 Ch
602[12.3 Pt

RZ PER
012350
503 12.2 Ch

R PSC
012502
500[11.4 Ch

RU AND
013238
503 10.8 Ch

Y AND
013338
503 13.5 Ch

X CAS
014958
548 11.3 Bn
557 11.8 Bn
566 11.5 Jo
570 11.8 Jo
576 12.0 Jo
596 12.0 Jo
600 11.9 Jo
602 12.3 Pt
603 11.9 Jo

U PER
015254
546 8.7 Ry
550 8.5 Jo
551 8.6 Ry
557 8.5 Ry

U PER
015254
557 8.5 Jo
562 9.1 Mc
563 8.4 Jo
571 8.5 Ry
575 8.6 Ry
587 8.6 Ry
594 8.5 My
596 8.4 Jo
597 8.5 My
602 8.3 Pt
603 8.7 Jo

XX PER
015654
503 8.0 Ch
515 8.2 Ch
543 8.4 Lt
576 8.5 Lt
580 8.5 Lt
595 8.4 Lt

R ARI
021024
503 9.6 Ch
515 9.9 Ch

W AND
021143a
508 13.6 Ch

T PER
021258
544 8.9 Ra
576 9.0 Lt
596 8.7 Jo
600 8.7 Jo
602 8.8 Pt
603 8.6 Jo

Z CEP
021281
503 13.5 Ch

X CAS
024217
501[11.5 Ch
542[14.4 Br
571[13.8 Br
602[12.5 Pt

o CET
021403
472 3.8 Fn
480 3.8 Fn
499 4.4 Ch
500 4.2 En
502 4.6 Ch
508 4.7 Ch
511 4.9 Ch
514 5.0 Ch
517 5.3 Ch
520 5.4 Ch
530 5.4 Hh

S PER
021558
531 9.8 Pk
553 9.4 Sz

S PER
021558
535 9.3 Cy
538 9.7 Rb
540 9.7 Pk
544 10.0 Ra
596 9.5 Jo
597 9.4 My
602 9.5 Pt
603 9.4 Jo

R CET
022000
500 8.2 Ch
512 7.8 Ch
520 8.0 Ch

RR PER
022150
503 13.4 Ch

R FOR
022426
534 9.5 Bl
544 9.5 Bl

U CET
022813
515[11.0 Ch
530[12.7 Ht

RR CEP
022980
501 10.8 Ch
534 11.8 Br
548 12.2 Br
571 12.9 Br
602[12.5 Pt

R TRI
023133
500 11.3 Ch
513 10.0 Ch

T ARI
024217
505 8.0 Ch
530 8.3 Ko

W PER
024356
500 9.5 Ch
510 9.2 Ch
515 9.7 Ch
530 9.9 Ko
535 9.8 Cy
544 9.6 Ra
550 9.9 Jo
557 10.0 Jo
557 9.6 Ry
558 9.5 Cy
562 9.6 Mc
563 10.4 Jo
564 9.8 Mc
571 9.5 Mc
571 9.8 Ry
575 9.8 Ry

W PER
024356
587 9.5 Ry
596 9.0 Jo
597 9.5 My
600 9.7 Mc
602 9.7 Pt
603 9.4 Jo

R HOR
025050
510 12.8 Sl
515 12.8 En
523 13.2 Sl
530 12.8 Ht
534 12.7 Ht
534 12.8 Bl
536 12.6 Sl
539 12.7 Ht
543 12.4 Sl
544 12.5 Bl
545 12.6 Ht
551 12.5 Ht
555 12.0 Bl

T HOR
025751
515[12.7 En
530[12.7 Ht
536 13.0 Bl
536 13.2 Sl
539[12.7 Ht
543 13.0 Sl
551[12.2 Ht

U ARI
030514
500 14.2 Bm
505 13.6 Ch
507 13.8 Bm
519 13.4 Bm

X CET
031401
505 10.3 Ch

Y PER
032043
500 9.4 Ch
513 9.3 Ch
530 9.3 Ko
531 8.5 Pk
540 8.3 Pk
544 9.0 Ra
550 8.3 Jo
557 8.3 Jo
559 8.5 Jo
596 8.6 Jo
602 8.5 Pt
603 8.5 Jo

R PER
032335
503 8.8 Ch

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs
U CAM	RX TAU	X CAM	R PIC	S PIC	T COL
033362	043208	043274	*044349*	*050848*	*051533*
535 8.4 Cy	503 10.6 Ch	574 8.6 My	560 9.0 Ht	513[12.9 En	539 9.7 En
537 8.3 Cy	513 10.2 Ch	584 9.6 Kn	566 9.0 Ht	533[13.4 Ht	544 10.0 Bl
542 8.1 Cy	529 10.1 Rb	589 10.0 My	566 8.8 En	536[13.4 Bl	544 9.9 Dk
543 7.7 Jo	536 10.0 Ch	596 10.5 Jo	V TAU	539[13.4 En	545 10.3 Ht
556 7.6 Jo	538 10.8 Rb	597 10.8 My	044617	547[12.9 En	551 10.3 Ht
558 7.5 Jo	544 10.3 L	600 10.7 Jo	509 10.6 Ch	551[12.9 Ht	555 10.1 Bl
558 8.2 Cy	R RET	601 11.0 Kn	534 13.2 Ch	566 13.0 Ht	556 10.0 Dk
563 7.5 Jo	*043263*	602 11.2 My	542 13.3 L	566 12.9 En	560 10.8 Ht
569 7.6 Jo	500 7.4 Sl	R DOR	AB AUR	R AUR	560 10.5 En
574 7.7 Jo	515 8.7 En	*043562*	044930	050953	566 11.0 En
596 7.7 Jo	524 8.4 Sl	500 5.5 Sl	543 6.9 Lt	509 10.6 Ch	566 10.8 Ht
600 7.8 Jo	530 9.0 Ht	515 5.6 En	R ORI	533 10.3 Ch	S AUR
603 7.6 Jo	533 9.9 En	524 5.6 Sl	045307	538 9.2 Sh	052034
U ERI	534 9.0 Bl	530 5.5 Ht	503 10.5 Ch	538 9.2 Hf	503 10.2 Ch
034625	534 9.1 Ht	533 5.4 En	534 11.3 Ch	539 9.4 Br	510 10.1 Ch
515 9.9 En	536 9.3 Sl	534 5.5 Ht	542 11.6 L	542 9.0 Hf	513 10.1 Ch
X PER	539 10.0 En	534 5.6 Bl	R LEP	542 9.1 Wd	515 10.1 Ch
034930	539 9.5 Ht	536 5.7 Sl	*045514*	543 9.0 Jo	530 10.0 Ch
543 6.4 Lt	543 9.6 Sl	539 5.7 En	500 7.4 Sl	544 9.0 Ra	530 9.2 Sq
T ERI	544 9.7 Bl	539 5.5 Ht	500 9.3 Ch	548 8.6 Jo	530 10.6 Ko
035124	545 9.9 Ht	543 5.8 Sl	508 9.3 Ch	550 8.2 Ch	531 8.7 Pk
515 10.9 En	547 10.2 En	544 5.5 Bl	509 7.3 Sl	553 7.6 Hf	533 10.1 Ch
T TAU	551 10.3 Ht	545 5.6 Ht	515 9.2 Ch	556 7.7 Jo	536 10.3 Ch
041619	555 10.0 Bl	547 5.6 En	523 7.3 Sl	558 7.6 Sh	537 9.3 B
500 10.5 Bm	560 10.4 Ht	551 5.6 Ht	530 9.3 Hh	558 7.6 Wd	538 9.6 Sh
507 10.5 Bm	566 11.0 Ht	553 5.6 Sl	530 8.7 BH	559 7.3 Jo	538 10.1 Hf
519 10.5 Bm	566 11.0 En	555 6.1 Bl	536 9.0 Ch	560 7.0 Pt	540 8.8 Pk
526 10.6 Bm	X CAM	560 5.6 Ht	536 7.1 Sl	563 7.2 Jo	541 9.6 B
R TAU	043274	566 5.5 Ht	537 9.7 Hh	566 7.0 Jo	542 10.1 Hf
042209	508 11.5 Ch	566 5.4 En	539 8.6 BH	566 7.8 Hz	542 10.1 Wd
500 8.8 Bm	530 9.8 Ch	R CAE	543 8.0 Rc	570 7.2 Jo	542 9.0 L
503 8.5 Ch	535 8.5 Cy	*043738*	543 7.1 Sl	570 6.8 Hf	542 10.6 Ko
507 8.7 Bm	539 9.0 Br	515 10.5 En	V ORI	574 6.8 Jo	544 10.0 Ra
519 9.1 Bm	541 9.2 Hf	533 10.6 En	050003	576 7.5 Ra	548 9.4 Jo
526 9.4 Bm	541 8.5 B	533 11.0 Ht	500 13.2 Bm	577 6.6 Jo	556 10.7 Kg
544 10.0 L	545 8.5 Kn	534 10.6 Bl	507 13.2 Bm	585 6.7 Hf	556 9.7 Hf
W TAU	546 8.6 Kn	539 11.1 Ht	516 12.9 Ch	T PIC	556 9.6 Wd
042215	549 8.7 Kn	539 10.7 En	526 12.0 Bm	*051247*	556 8.9 L
503 10.2 Ch	550 8.5 Wd	544 10.7 Bl	534 11.8 Ch	513 12.5 En	556 9.3 Jo
535 10.7 Cy	550 8.8 Jo	545 11.1 Ht	544 10.8 L	533 13.3 Ht	559 9.3 Jo
536 10.4 Ch	553 8.7 Hf	551 11.2 Ht	T LEP	536[13.1 Bl	559 9.3 Pk
544 10.8 So	556 8.7 Kn	555 11.0 Bl	*050022*	551[13.1 Ht	560 9.8 Pt
544 11.0 L	556 8.3 Jo	560 11.2 Ht	500 9.0 Bm	560[13.1 Ht	561 9.0 Pk
S TAU	558 8.3 Jo	566 11.3 Ht	505 8.8 Ch	566[13.1 En	562 9.5 Mc
042309	558 8.5 Kn	R PIC	507 9.4 Bm	T COL	562 8.9 Be
503[13.5 Ch	559 8.6 Kn	*044349*	513 9.4 En	*051533*	565 10.3 Ko
519[13.1 Bm	560 8.4 Pt	513 7.2 En	526 9.6 Bm	500 7.9 Dk	565 9.0 My
526[12.8 Bm	561 8.7 My	533 7.5 Ht	530 9.8 BH	507 8.2 Dk	566 9.2 Jo
536[13.5 Ch	562 8.6 Kn	533 7.3 En	533 10.3 En	512 8.4 Dk	W AUR
T CAM	563 8.4 Jo	534 7.4 Bl	534 10.1 Bl	513 8.1 En	052036
043065	565 8.8 My	539 7.9 Ht	536 10.4 Ch	517 8.6 Dk	481 11.6 Fn
508 12.8 Ch	569 8.8 Kn	539 7.7 En	539 10.7 En	523 9.0 Dk	503 9.6 Ch
536 13.5 Ch	570 8.5 Jo	544 8.0 Bl	539 10.4 BH	531 9.2 Dk	509 8.7 Fn
539 13.9 Br	570 8.4 Hf	545 8.1 Ht	544 10.0 Bl	533 9.5 Ht	529 8.6 Fn
546 14.0 Br	574 8.5 Hz	547 8.5 Bl	555 10.6 Bl	533 9.0 En	533 8.9 Ch
563 12.0 Ra	574 8.9 Kn	551 8.7 Ht	568 10.8 En	534 9.0 Bl	533 8.9 Ch
	574 8.5 Jo	555 8.3 Bl		537 9.4 Dk	538 8.9 Hf
		560 8.6 En		539 9.8 Ht	538 8.9 Sh

Variable Star Observations Received During May and June, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
W Aur	S Cam	RR Tau	SU Tau	S Col	U Ori
052036	053068	053326	054319	*054331*	054920a
542 8.9 Ht	500 9.7 Ch	542 11.3 Wp	537 10.9 B	566 10.7 Ht	537 9.0 Kp
542 8.9 Wd	536 8.5 Ch	542 11.3 L	538 11.5 Rb	566 10.5 En	537 9.8 Lu
542 8.5 L	541 8.9 Hf	542 11.3 Ko	538 11.0 Br	Z Tau	538 9.2 Kp
548 8.7 Jo	546 8.8 Kn	543 11.3 L	539 11.0 Br	054615a	538 8.8 Sq
555 9.0 Hf	549 8.7 Kn	543 11.5 Be	542 11.4 Hf	500 13.6 Bm	540 9.1 Kp
555 8.9 Sh	550 8.7 Wd	544 11.5 Wp	542 11.5 Wd	505 13.8 Ch	540 9.4 Hf
555 8.8 B	550 8.1 Jo	544 11.7 Wa	542 11.6 Br	507 12.8 Bm	540 9.0 Rc
556 9.4 Hf	556 8.1 Jo	544 11.2 L	542 11.9 Wa	534 13.0 Ch	542 9.4 Hf
556 9.3 Wd	556 8.6 Kn	545 11.2 L	542 11.8 Wp	544 11.6 L	542 9.5 Wd
556 8.6 L	558 8.6 Kn	545 11.1 Br	542 11.9 Cy	548 11.0 Bm	543 9.7 Ah
559 9.6 Jo	558 8.2 Jo	546 11.2 L	542 12.0 L	554 9.8 Bm	544 9.8 Sx
560 9.0 Pt	559 8.6 Kn	547 11.0 Br	542 11.6 Ko	RU Tau	544 9.0 L
560 9.6 Hi	560 8.9 Pt	548 11.6 Bm	543 12.2 L	054615c	548 9.5 Jo
562 9.5 Be	561 8.5 My	548 11.4 Br	543 12.1 Pt	500 13.2 Bm	549 9.2 Rc
567 9.9 Hi	563 8.5 Jo	549 11.9 Wa	543 12.0 Be	507 13.1 Bm	550 9.6 Ch
S Ori	564 8.6 Kn	549 11.9 Wp	544 12.2 Be	544 12.6 L	553 9.7 Ra
052404	565 8.5 My	553 12.1 Wp	544 11.9 Pt	548 12.4 Bm	555 9.7 Wd
503 10.2 Ch	566 8.4 Jo	553 12.2 Wa	544 12.0 L	554 12.8 Bm	555 9.6 L
513 10.3 Ch	570 8.4 Jo	554 12.0 Bm	544 12.4 Ko	R Col	557 9.8 Wd
529 10.8 Rb	570 8.6 Hf	555 11.2 Be	544 12.4 Wp	*054629*	557 10.0 Jo
533 11.2 Ch	574 8.6 My	555 12.3 Wp	544 12.3 Wa	505 13.6 Ch	559 9.8 Wd
538 11.2 Rb	574 8.5 Jo	555 12.2 Wa	544 12.0 Ar	536 13.0 Bl	559 10.2 Lu
544 11.5 L	574 9.0 Hz	556 12.0 L	545 12.0 Br	539 13.6 En	562 9.7 Rc
550 11.6 Ch	575 8.5 Kn	558 13.2 Wa	546 12.4 Br	544 12.8 Bl	565 9.9 Wd
T Ori	590 8.5 Kn	558 13.2 Wp	546 12.4 L	547 12.7 Bl	566 9.8 Kg
053005a	596 8.1 Jo	558 12.6 Cy	548 12.7 Br	547 13.0 En	567 10.2 Be
454 9.7 Gw	597 8.2 My	559 13.3 Wp	549 12.4 Wa	551 12.6 Ht	V Cam
503 9.3 Ch	600 8.3 Jo	559 13.4 Wa	550 12.9 Ch	555 11.6 Bl	054974
508 9.5 Ch	602 8.3 My	562 12.4 Be	553 12.9 Wa	560 11.1 En	508[13.6 Ch
510 9.6 Ch	β Dor	RU Aur	555 13.0 L	560 11.9 Ht	536[13.6 Ch
513 9.9 Gw	*053262*	053337	558 13.4 Wa	566 11.4 Ht	545[14.2 Br
515 9.7 Ch	500 3.6 En	542 13.9 Br	558 13.3 Wp	566 11.1 En	560[12.6 Pt
529 9.6 Rb	515 4.0 En	542 13.5 L	559 13.2 Wa	α Ori	Z Aur
530 10.0 Ko	516 3.8 En	562 11.4 Be	S Col	054907	055353
533 10.0 Ch	533 4.0 En	565 11.3 My	*054331*	509 0.4 Sl	530 10.0 Rb
535 10.7 Cy	541 3.6 En	U Aur	503 10.2 Dk	536 0.3 Sl	535 9.4 Cy
536 11.1 Ch	542 3.5 En	053531	505 9.7 En	543 0.2 Sl	543 10.5 Pt
536 10.2 Gw	560 3.8 En	542 13.2 L	507 10.0 Dk	543 0.8 Lt	548 10.1 Jo
536 10.6 Ar	568 3.6 En	556 13.3 L	512 9.8 Dk	U Ori	552 10.7 B
537 11.2 B	RR Tau	SU Tau	513 9.3 En	054920a	558 10.9 Cy
537 10.7 Cy	053326	054319	517 9.7 Dk	500 7.4 Ch	559 10.6 Jo
538 11.0 Rb	500 12.6 Bm	500 10.0 Ch	523 9.6 Dk	508 7.5 Ch	560 11.0 Pt
542 9.6 Cy	507 12.0 Bm	505 9.8 Ch	531 9.3 Dk	515 7.8 Ch	562 10.3 Mc
542 9.5 Ko	526 11.6 Bm	510 9.9 Ch	533 9.3 Ht	529 8.8 Sq	563 10.6 Jo
543 9.5 Pt	529 11.7 Rb	515 10.0 Ch	533 9.6 En	529 9.0 Kp	564 10.2 Mc
543 9.6 Wd	530 11.5 Br	529 10.7 Rb	534 9.2 Bl	530 8.9 Kp	565 10.9 Cy
544 9.5 Pt	531 11.4 Br	530 10.6 Br	537 9.2 Dk	530 9.0 BH	569 11.1 Pt
544 9.9 L	533 11.4 Br	530 10.3 Ko	539 9.6 Ht	530 8.9 Pa	570 11.0 Jo
544 9.2 Ko	534 11.5 Br	531 10.7 Br	539 9.6 En	533 9.0 Ch	574 10.9 Rb
546 10.1 L	535 12.3 Cy	533 10.7 Br	544 9.4 Bl	533 9.0 Kp	576 10.7 Jo
546 9.6 Pt	535 11.8 Ko	533 10.7 Ch	544 9.0 Dk	533 9.4 Pa	587 10.4 Pt
550 9.4 Ch	536 12.2 Br	534 10.8 Br	545 9.6 Ht	534 9.3 Ah	588 10.3 Pt
553 10.0 Ra	537 12.3 Cy	535 10.4 Cy	547 9.8 En	535 9.0 Kp	600 9.8 Mc
AN Ori	537 11.9 B	535 10.7 Ko	551 9.9 Ht	536 9.8 Lu	R Oct
053005t	538 11.6 Br	536 10.8 Ko	555 9.5 Bl	536 9.1 Kp	*055686*
536 11.2 Ar	539 11.5 Br	536 10.8 Ar	556 9.6 Dk	536 9.6 Pa	515 11.0 En
538 11.7 Rb	542 11.4 Br	536 10.8 Br	560 10.2 En	536 9.0 BH	533 11.6 Ht
	542 11.4 Wa	537 10.4 Cy	560 10.2 Ht	536 8.9 Je	534 11.7 Bl

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
R OCT	V MON	S LYN	V CMI	R GEM	R CMI
055686	*061702*	063558	070109	070122a	070310
539 11.7 Ht	530 8.0 Ko	538 13.3 Br	513 13.7 Ch	574 9.9 Rb	555 8.5 Ra
542 11.5 En	533 7.9 Pa	546 13.6 Br	534[13.5 Ch	577 10.8 Jo	555 8.6 Sh
543 11.6 Sl	536 8.0 Kp	550 13.0 Ch	542 14.5 L	581 9.8 Wd	556 8.3 Jo
545 11.6 Ht	537 8.0 Kp	552 12.8 Ra	559[12.5 Gy	581 9.8 Hf	556 8.6 Wd
555 11.8 Bl	538 8.1 Kp	565 13.3 GC	567[14.1 Be	Z GEM	559 8.4 Jo
563 12.0 Ht	538 8.2 Hf	572[13.0 Ry	R GEM	070122b	559 8.5 Gy
567 11.6 En	538 8.2 Sh	Y MON	070122a	544 12.3 Ra	561 8.5 Wx
X AUR	540 8.0 Kp	065111	500 7.6 Ch	559 12.4 Wd	561 8.6 Oy
060450	542 8.0 Kp	510 10.1 Ch	515 7.9 Ch	560 12.6 Pt	563 8.5 Jo
505 10.2 Ch	542 7.2 Ko	530 9.7 Pa	530 8.6 Pa	565 12.5 Wd	563 8.7 Kn
513 10.1 Ch	543 7.4 Wd	540 10.0 Hf	534 9.3 Ah	569 12.1 Ra	564 8.4 Oy
515 9.9 Ch	550 7.5 Ch	542 10.5 L	535 9.4 Lu	TW GEM	564 8.7 Sx
518 9.6 Ch	558 7.5 Ko	550 10.5 Ch	535 9.3 Fs	070122c	565 9.0 Mi
530 9.1 Ch	565 7.2 Ko	552 10.3 B	536 9.4 Lu	538 8.3 Hf	565 9.3 Wd
536 8.6 Ch	AG AUR	556 10.6 L	536 8.9 Je	538 8.4 Sh	566 8.8 Kn
538 8.5 Br	062047	567 11.2 Be	537 9.6 Ah	543 8.2 Lt	566 8.6 Jo
543 8.9 Hf	540 9.3 Be	X MON	538 8.5 Sh	543 8.5 Wd	567 8.8 Be
544 8.6 Ra	545 9.3 L	*065208*	538 9.3 Lu	544 8.2 Da	569 8.8 Jo
550 8.3 Ch	555 9.4 L	530 8.6 Pa	538 8.7 Hf	544 8.6 Ra	569 8.7 Ra
553 8.6 Hf	562 9.4 Be	531 8.3 Pk	538 9.3 Fs	544 8.4 Sx	570 9.0 Hf
555 8.5 Wd	UU AUR	533 8.3 Pk	542 8.6 L	553 8.2 Hf	574 9.3 Jo
555 8.3 B	062938	533 8.7 Pa	543 9.4 Wd	555 8.4 Wd	574 8.8 Wx
557 8.2 Jo	537 5.5 Lt	534 8.4 BH	543 9.6 Ah	555 8.2 Sh	574 9.1 Oy
559 8.2 Jo	543 5.5 Lt	536 8.7 Pa	544 8.9 Sx	556 8.3 Kg	R VOL
560 8.5 Pt	555 5.5 Lt	538 9.0 Hf	544 9.5 Ra	559 8.4 Wd	*070772*
563 8.5 Kn	564 5.6 Lt	538 9.0 Sh	544 9.3 Je	560 7.9 Pt	513[13.4 En
563 8.2 Jo	568 5.6 Lt	539 9.3 BH	544 8.2 Da	564 8.2 Lt	533 13.6 En
566 8.3 Jo	577 5.3 Lt	540 8.9 Pa	550 8.8 Ch	564 8.6 Sx	539[13.4 Ht
566 8.6 Kn	U LYN	540 8.4 Pk	552 9.6 Ah	565 8.3 Wd	551[13.4 Ht
569 8.5 Jo	063159	544 9.0 Sx	553 9.6 Hf	566 8.6 Kg	563[13.4 Ht
570 9.2 Hf	565 14.0 GC	557 9.6 Jo	555 9.6 Wd	569 8.4 Ra	566 12.8 En
574 8.7 Kn	R MON	R LYN	555 10.1 L	570 8.3 Hf	L2 PUP
574 8.6 Jo	063308	065355	555 9.4 Sh	574 8.5 Sx	*071044*
576 8.9 Ra	510 13.0 Ch	513 11.6 Ch	556 8.8 Jo	581 8.2 Wd	500 4.2 Sl
588 9.7 Kn	514 13.0 Ch	538 12.1 Br	556 9.6 Fs	581 8.2 Hf	509 4.4 Sl
V AUR	536 13.0 Ar	545 12.2 Br	556 9.4 Kg	R CMI	523 5.0 Sl
061647	537 12.8 Ch	RS GEM	557 9.6 Lu	070310	536 4.7 Sl
505 10.8 Ch	539 11.0 BH	065530	557 9.3 Je	510 8.1 Ch	543 4.7 Sl
533 9.8 Ch	559 12.2 Jo	530 11.2 Rb	559 9.7 Wd	513 7.6 Ch	553 4.9 Sl
540 8.7 Be	NOV PIC	538 11.4 Rb	559 9.0 Jo	530 8.3 Pa	RR MON
541 9.8 B	*063462*	542 11.6 L	559 9.3 Je	530 8.0 Sq	071201
545 8.8 L	500 8.8 En	546 11.3 So	559 9.6 Fs	533 8.4 Wx	510[13.2 Ch
548 8.7 Jo	513 8.8 En	551 11.3 So	560 10.0 Pt	534 8.2 Ch	543[14.7 L
555 9.0 L	533 8.4 Ht	555 11.8 L	563 9.5 Jo	534 8.7 Ah	550[12.3 Ch
557 8.7 Jo	533 8.7 En	559 11.5 Jo	564 9.8 Sx	540 8.7 Hf	559[13.4 GC
559 9.0 Jo	539 8.7 En	563 11.1 So	565 9.8 Wd	540 8.0 Be	567[12.0 Be
559 10.0 Gy	539 8.6 Ht	563 11.8 SR	565 9.7 Lu	540 8.4 Sq	V GEM
562 8.9 Be	545 8.7 Ht	566 11.7 Jo	566 9.4 Je	542 8.2 L	071713
563 9.2 Jo	547 8.7 En	567 12.0 Be	566 9.8 Fs	543 8.5 Ah	510 8.8 Ch
566 9.0 Jo	551 8.7 Ht	570 11.5 Jo	566 9.6 Jo	544 8.5 Sx	532 8.6 L
569 9.0 Jo	560 8.8 En	573 11.5 SR	566 9.5 Hz	544 8.1 Da	534 8.6 Ch
574 9.0 Jo	563 8.7 Ht	576 11.3 Jo	566 9.6 Kg	548 8.0 Jo	545 8.9 L
577 9.3 Jo	566 8.8 En	Z CMA	567 9.5 Be	550 8.7 Oy	551 9.5 B
588 9.6 Gy	568 8.7 Ht	*065011*	569 9.8 Ra	551 8.4 B	555 9.5 L
V MON	577 8.9 En	500 9.8 Sl	570 9.7 Jo	553 8.8 Hf	557 9.6 Jo
061702	S LYN	509 9.8 Sl	570 10.1 Hf	553 8.4 Wa	559 10.0 Jo
509 9.1 Ch	063558	523 9.9 Sl	574 10.1 Sx	553 8.4 Wp	560 10.0 Pt
530 8.3 Pa	510 11.8 Ch	536 9.9 Sl	574 10.6 Jo	555 8.2 L	563 10.2 Jo

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
V GEM			**T CMI**			**S GEM**			**R CNC**			**R CNC**			**U CNC**		
071713			072811			073723			081112			081112			083019		
565	10.2	GC	545	12.0	L	545	12.0	L	508	8.3	Gs	581	7.0	Hf	570	11.5	Sf
566	10.4	Jo	552	11.9	B	546	11.7	So	508	8.9	Ch	587	6.9	Pt	**X UMA**		
567	10.0	Be	553	12.3	Wp	563	12.4	So	530	8.8	Pa	588	7.0	Hi	083350		
569	10.6	Jo	553	12.4	Wa	567	12.6	Be	530	8.6	Sq	588	6.9	Hf	560[	12.5	Pt
S UMI			560	12.5	Pt	587[	11.5	Pt	531	8.8	Hi	588	6.7	Cy	594[	13.3	B
072708			567	12.5	Be	**W PUP**			532	8.4	L	**V CNC**			**S HYA**		
481	10.8	Fn	**Z PUP**			*074241*			534	8.7	Ah	081617			084803		
507	9.8	Ru	*072820b*			500	8.8	En	534	8.6	Ch	508	9.3	Ch	509	11.5	Ch
509	9.5	Fn	503	13.8	Bm	513	9.1	En	536	8.9	Je	515	10.0	Ch	515	11.2	Ch
510	9.4	Ch	507	14.0	Bm	533	11.1	Ht	536	8.3	Ar	532	10.4	L	519	11.0	Ch
528	9.1	Ch	515	14.1	Bm	533	10.9	En	537	8.8	Ah	545	12.2	Cy	530	10.2	Pa
529	9.4	Fn	539[	12.6	En	534	11.1	Bl	538	8.8	Sh	546	11.5	L	540	9.7	Hf
530	9.2	Be	554[	13.7	Bm	539	11.7	Ht	538	8.7	Hf	552	12.1	Ra	543	9.5	Ah
530	8.9	Pa	566[	12.6	En	539	11.4	En	540	8.6	Sq	559	12.3	Gy	555	8.6	Hf
531	9.2	Ko	**S VOL**			545	12.1	Ht	543	8.7	Ah	564	12.1	So	555	8.4	Sh
532	8.9	L	*073173*			547	12.3	En	544	8.0	Ar	565	12.1	Cy	556	8.5	Wd
536	9.2	Pa	533	13.2	Ht	555	12.2	Bl	544	8.6	Sx	576[	12.0	Ra	560	8.7	Pt
540	8.9	Hf	533	13.4	En	560	12.2	En	544	8.9	Je	**RT HYA**			565	8.5	Jo
541	9.1	Fn	537	13.2	Bl	563	12.0	Ht	545	7.9	Ar	*082405*			565	8.1	GC
542	9.3	Ko	539	13.2	Ht	566	11.9	En	545	8.3	Cy	531	7.8	Ko	566	8.1	Wd
543	8.9	Be	539	13.0	En	**T GEM**			545	7.5	Hi	531	7.7	BH	566	8.2	Hf
543	9.2	Ru	545	12.8	Ht	074323			546	8.2	L	557	8.1	Ko	569	8.0	Jo
544	9.2	Sx	547	13.0	En	508	8.8	Ch	548	7.8	Jo	561	7.9	My	570	8.1	Hf
545	8.8	L	551	12.8	Ht	514	9.0	Ch	550	8.2	Oy	565	8.0	My	574	8.2	Jo
550	8.7	Ch	555	12.5	Bl	532	9.9	L	552	8.0	Ra	565	8.1	Ko	576	8.0	Ra
551	8.7	B	560	12.5	En	536	10.4	Ch	555	7.4	L	565	8.4	Kn	581	8.1	Wd
553	8.7	Hf	563	12.1	Ht	537	10.7	Cy	555	7.5	Hf	565	7.7	Jo	581	8.1	Hf
553	8.3	Wa	568	12.2	Ht	539	10.8	Br	555	7.4	Sh	566	8.3	Kn	587	7.6	Pt
553	8.4	Wp	**U CMI**			544	10.8	Da	556	7.3	Jo	574	8.5	Kn	**T HYA**		
553	9.2	Ra	*073508*			545	11.0	L	556	7.3	Wd	**R CHA**			*085008*		
555	8.8	Sh	510	8.0	Ch	546	11.3	So	557	7.6	Je	*082476*			509	7.5	Ch
555	8.6	L	532	8.6	L	559	12.5	Gy	558	7.2	Hi	533	12.5	Ht	519	7.4	Ch
556	8.5	Wp	534	8.7	Ch	563	12.9	So	559	7.3	Jo	533	12.6	En	531	8.0	BH
556	8.7	Wa	537	8.5	Cy	567	12.7	Be	559	7.0	Gs	537	12.8	Bl	538	8.2	Sh
556	8.7	Wd	543	8.8	Be	587[	11.5	Pt	560	7.2	Pt	539	12.4	En	538	8.2	Hf
556	8.5	Jo	545	8.8	L	**U PUP**			561	7.0	Ar	539	12.4	Ht	544	8.2	Sx
557	8.6	Ko	551	8.7	B	*075612*			561	7.4	Oy	543	12.4	Sl	544	8.5	Wx
558	8.3	Sh	555	9.0	L	510	13.5	Ch	563	7.1	Jo	545	12.3	Ht	555	8.7	Sh
559	8.5	Jo	556	8.8	Jo	534[	13.4	Ch	563	6.9	Ar	547	12.4	En	556	8.7	Hf
560	8.4	Pt	558	8.9	Cy	**RV CNC**			563	6.7	Gw	551	12.3	Ht	556	8.7	Wd
561	8.8	Wh	559	9.0	Jo	080319			563	7.0	B	555	12.4	Bl	559	8.8	Cy
563	8.4	Jo	560	9.0	Pt	530	12.0	Br	564	7.1	Mc	563	12.3	Ht	559	8.5	Gs
565	8.6	Wd	563	9.0	Jo	531	12.0	Br	564	6.9	Oy	566	11.8	En	562	9.1	Wx
566	8.7	Sx	565	9.1	Cy	533	12.0	Br	564	7.1	Sx	568	12.2	Ht	564	9.1	Sx
566	8.4	Jo	566	9.1	Jo	534	12.0	Br	565	6.8	Mi	**U CNC**			565	9.3	Cy
567	8.3	Be	567	9.4	Be	536	12.2	Br	565	6.9	Cy	083019			565	9.1	Jo
569	8.3	Jo	569	9.3	Jo	538	12.0	Br	566	6.7	Hi	508	9.8	Ch	566	9.4	Sh
569	8.6	Ra	574	9.4	Jo	539	11.9	Br	567	7.0	Hz	532	9.6	L	566	9.1	Hf
570	8.3	Hf	577	9.6	Jo	542	11.9	Br	569	7.4	Ra	540	9.7	Hf	566	9.0	Wd
574	8.0	Jo	**S GEM**			545	11.9	Br	570	7.0	Jo	545	10.4	Cy	570	8.8	Hf
574	8.7	Sx	073723			546	11.8	Br	573	6.6	Hi	546	10.2	L	570	9.6	Jo
575	8.3	Sh	508	10.6	Ch	547	12.2	Br	574	7.0	Jo	555	10.4	L	574	9.7	Sx
577	8.2	Jo	514	10.6	Ch	567	11.8	Br	574	6.9	Oy	556	10.6	Hf	574	9.9	Wx
T CMI			532	11.7	L	569	12.0	Br	575	6.8	Sx	556	10.5	Wd	588	10.2	Wx
072811			536	11.7	Ch	570	11.9	Br	575	6.9	Sh	563	11.0	B	**T CNC**		
510	11.1	Ch	537	12.0	Cy	571	12.0	Br	575	6.8	Hf	564	11.7	So	085120		
532	11.7	L	539	12.2	Br	572	12.1	Br	577	7.0	Jo	565	11.3	Cy	510	9.0	Ch
534	11.6	Ch	541	11.8	B				581	7.1	Wd	565	11.5	GC	532	8.9	L

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
T CNC		RW CAR		X HYA		R LMI		R LEO		R LEO	
085120		*091868*		*093014*		093934		094211		094211	
544	9.0 Lt	505	[12.8 En	537	10.0 Fn	570	11.2 Hf	542	9.8 Kp	570	9.8 Hf
545	9.6 Cy	537	[12.8 Bl	539	9.6 BH	570	10.9 Jo	543	9.5 Ah	571	9.3 Mc
546	8.7 L	541	[12.8 En	539	9.8 Rc	573	11.3 Gy	543	9.9 Pa	572	9.7 Je
548	8.3 Jo	551	[12.8 Ht	543	9.6 Hf	573	11.4 Hi	544	9.8 Sx	573	9.2 SR
555	8.4 L	566	[12.8 En	547	9.7 Rc	574	11.3 Rb	544	9.0 Je	573	9.3 Mi
559	8.4 Jo	571	[12.8 En	554	8.4 Bm	576	11.0 Jo	545	9.5 Ch	573	9.0 Ah
560	8.3 Pt	Y VEL		556	8.7 Hf	581	10.7 Hf	546	9.3 Si	574	9.0 Lu
563	8.3 Jo	*092551*		556	8.6 Wd	581	10.5 Wd	546	9.7 Kp	574	9.8 Oy
565	9.5 Cy	515	12.1 En	559	8.5 Gy	587	9.8 Pt	547	9.3 Wx	574	9.8 Sx
567	9.0 Lt	534	10.9 Ht	560	9.5 Rc	588	9.8 Hi	548	9.2 Lu	574	9.0 Wx
569	9.0 Lt	534	10.8 Bl	562	8.5 Kn	588	9.6 Sz	548	9.8 Kp	574	9.2 Ba
570	8.4 Jo	539	10.8 Ht	563	8.4 Kn	588	9.7 Gy	548	9.0 Fs	574	9.3 Pk
574	8.4 Jo	540	10.1 Bl	563	8.5 Sx	588	10.5 Hf	548	8.9 Jo	575	9.8 Sq
576	8.7 Lt	541	10.2 En	563	8.3 Jo	594	9.0 Jo	549	9.6 Kp	575	9.4 Sh
577	8.3 Jo	545	10.2 Ht	566	8.3 Sh	596	8.9 Jo	549	9.4 Wa	575	8.8 Wp
587	8.0 Pt	547	10.0 En	566	8.2 Ra	599	8.7 Gy	549	9.6 Wp	575	9.7 Wd
S PYX		551	10.0 Ht	566	8.5 Sx	600	8.2 Jo	549	9.4 Ah	575	8.9 Wa
090024		555	9.8 Bl	566	8.4 Wd	RR HYA		550	9.3 Oy	575	9.4 Hf
503	10.3 Bm	560	9.8 Ht	566	8.2 Hf	*094023*		550	9.3 Wd	576	9.0 Io
509	10.2 Ch	566	9.9 Ht	570	8.2 Jo	503	10.1 Bm	552	9.7 Ra	581	9.0 Wp
515	10.0 Bm	566	9.5 En	570	8.6 Rc	509	9.3 Ch	555	9.4 Kp	581	9.1 Fi
530	10.9 Ko	571	9.8 En	570	8.3 Hf	515	9.9 En	555	9.9 Hf	581	8.9 Wd
542	11.3 Ko	R CAR		574	8.7 Sx	515	9.3 Bm	555	9.6 Wd	581	9.0 Wa
548	12.0 Bm	*092962*		574	8.4 Jo	541	9.8 En	555	9.9 Sh	581	9.0 Lu
554	12.4 Bm	499	4.7 Dk	575	8.4 Kn	554	10.4 Bm	556	9.6 Kg	581	9.0 Hf
T PYX		500	4.5 Sl	577	8.5 Jo	565	11.4 My	556	8.9 Fs	581	9.0 Fs
090031		500	4.7 En	578	8.4 Ra	566	10.8 En	557	9.1 Lu	584	8.9 Wx
537	[t Bl	505	4.9 En	588	8.4 Kn	577	11.8 En	557	9.1 Ba	585	8.5 Ba
V UMA		506	5.0 Dk	Y DRA		587	8.4 Pt	557	9.0 Je	585	9.4 Kp
090151		512	5.5 Dk	093178		R LEO		558	9.6 Ah	588	9.2 Wp
558	10.7 GC	515	5.1 En	510	13.1 Ch	094211		559	9.2 Fs	588	9.0 Fi
563	10.6 Mc	517	5.5 Dk	533	10.0 Br	505	8.8 Ch	559	9.3 Jo	588	9.0 Wa
563	10.4 So	523	5.6 Dk	536	10.3 Cy	515	9.1 Ch	561	9.3 Sq	588	8.9 Hf
565	10.7 Jo	524	5.3 Sl	545	9.0 Cy	529	9.6 Kp	561	9.1 Wx	588	8.8 Sz
565	10.6 GC	530	5.8 Ht	557	9.3 Jo	530	9.6 Kp	561	9.6 Oy	589	8.9 Lu
570	11.0 Jo	531	5.8 Dk	558	9.8 Cy	530	9.1 Pa	562	8.7 Mc	589	9.0 Wa
576	11.0 Jo	534	5.7 Bl	559	9.4 Jo	530	9.0 Sq	563	9.5 Wa	589	9.3 Kp
591	10.9 GC	534	6.4 Ht	565	9.5 Jo	531	8.8 Pk	563	9.7 Wp	590	9.0 Sh
592	11.0 GC	537	6.0 Dk	565	9.5 Cy	531	9.0 BH	563	9.2 Jo	590	9.7 Mc
596	11.2 Jo	539	6.3 Ht	570	9.7 Jo	532	9.4 Kp	563	9.0 SR	593	8.6 Wp
598	10.9 Mc	541	6.3 En	576	9.6 Jo	533	9.6 Kp	564	9.8 Sx	593	8.5 Wa
600	11.0 Mc	543	6.1 Sl	R LMI		533	9.7 Pa	564	9.0 Mc	594	9.0 Jo
600	11.0 Jo	544	6.3 Dk	093934		533	9.3 Wx	564	8.6 Pt	594	8.9 Kg
603	11.1 Jo	545	6.4 Ht	510	12.0 Ch	535	9.0 Lu	564	9.9 So	595	8.8 SR
W CNC		547	6.3 En	531	12.1 Hi	535	9.4 Kp	564	9.8 Oy	596	8.8 Jo
090425		551	6.5 Ht	533	12.0 Br	535	8.9 Fs	565	9.6 Lu	596	8.7 Wa
510	13.3 Ch	555	7.0 Bl	545	12.0 Hi	535	9.8 Pa	565	9.9 Ba	596	8.5 Ba
532	14.0 L	556	6.6 Dk	552	10.8 Ra	536	9.6 Kp	565	9.2 Wd	597	8.7 SR
533	13.5 Br	560	7.1 Vt	558	11.9 Hi	536	9.2 Ah	565	9.9 Mi	598	8.8 Mc
536	13.6 Ar	566	7.6 Ht	559	11.2 Jo	536	9.0 Je	566	9.6 Je	599	8.8 Wa
544	13.3 Ar	566	7.0 En	559	11.6 Gy	537	9.6 Kp	566	9.7 Kg	600	8.5 Jo
545	13.6 Ar	571	7.3 En	563	10.8 Jo	538	9.7 Kp	566	9.8 Hf	600	9.0 Mc
545	13.7 Br	X HYA		564	11.6 Pt	540	9.0 Sq	566	9.8 Wd	601	8.8 SR
546	14.0 L	*093014*		565	10.9 Jo	540	9.7 Kp	566	9.8 Wa	601	8.9 Wa
561	13.8 Ar	503	10.8 Bm	565	12.0 Wd	540	9.8 Pa	566	9.7 Sh	603	8.7 SR
563	13.8 B	509	10.8 Ch	565	11.6 Wa	541	9.7 Kp	566	9.3 Fs	1 CAR	
573	13.5 Ar	515	10.0 Bm	565	11.5 Wp	541	9.9 Hf	569	9.3 Ra	*094262*	
		531	10.0 BH	569	10.7 Ra	541	9.8 We	570	9.2 Jo	500	4.4 En

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
1 CAR		**RR CAR**		**Z CAR**		**R UMA**		**V HYA**		**RS CEN**	
094262		*095458*		*101058a*		103769		*104620*		*111661*	
505	4.2 En	566	8.0 Ht	534	12.1 Bl	555	10.6 Wd	557	7.2 Ko	515	9.0 En
515	3.8 En	566	7.7 En	539	12.4 Ht	556	10.6 Wd	559	7.4 Jo	533	10.0 Ht
516	3.7 En	577	7.7 En	545	12.4 Ht	556	10.8 Wg	560	8.4 Rc	533	9.5 En
533	4.2 En	**RV CAR**		555	12.4 Bl	556	10.6 Hf	563	7.5 Kn	534	10.0 Bl
541	3.8 En	*095563*		566	12.6 En	557	9.8 Je	564	6.6 Pt	539	10.5 Ht
542	4.0 En	539	13.2 Ht	**W VEL**		558	10.7 Hi	565	7.5 Jo	541	10.2 En
543	4.2 Sl	541	12.9 En	*101153*		560	11.0 Sq	565	7.6 Kn	542	10.5 En
547	3.9 Sl	545	13.0 Ht	515	13.0 En	563	10.2 Mc	566	7.6 Jo	545	10.8 Ht
547	3.8 En	563	12.5 Ht	534	12.5 Bl	563	11.2 So	570	7.5 Jo	551	11.2 Ht
553	3.6 Sl	566	11.6 En	541	12.5 En	563	11.0 SR	570	8.2 Rc	555	11.2 Bl
566	4.0 En	568	12.2 Ht	545	12.5 Ht	564	11.0 Pt	574	7.7 Jo	563	12.8 Ht
568	4.0 En	577	12.0 En	555	11.7 Bl	564	10.2 Ah	577	7.5 Jo	566	12.7 En
571	4.2 En	**S CAR**		563	12.5 Ht	565	11.3 Mi	577	7.9 Jo	568	12.6 Ht
574	4.3 En	*100661*		566	12.0 En	565	10.6 Wd	577	7.5 Ko	577	13.1 En
Y HYA		499	6.6 Dk	577	11.6 En	565	11.1 Cy	589	8.0 Kn	**X CEN**	
094622		500	6.7 En	**U HYA**		566	10.8 Hf	589	6.8 Pt	*114441*	
515	8.0 En	500	6.5 Sl	*103212*		566	10.7 Sh	597	7.7 Jo	516	8.8 En
541	7.5 En	506	7.0 Dk	510	5.2 Ch	566	10.8 Wd	600	7.6 Jo	533	9.6 Ht
Z VEL		512	7.5 Dk	529	5.6 Ka	566	10.0 Je	601	7.8 Kn	534	9.6 Bl
094953		515	7.4 En	530	5.6 Ka	567	11.0 Hz	603	7.5 Jo	539	9.9 Ht
500	11.5 Sl	517	7.9 Dk	544	5.6 Ka	569	11.3 Ra	**RS HYA**		542	9.9 En
505	11.4 En	523	8.0 Dk	545	5.5 Ka	573	11.5 SR	*104628*		545	9.9 Ht
515	10.9 En	524	7.3 Sl	550	4.5 Oy	573	11.5 Mi	511	13.1 Ch	551	10.4 Ht
524	10.5 Sl	530	7.9 Ht	561	5.1 Oy	573	10.5 Ah	515	13.5 En	556	10.4 Bl
530	10.0 Ht	531	7.9 Dk	564	5.3 Oy	573	11.3 Cy	537	13.8 Bl	560	10.7 Ht
534	9.8 Ht	534	7.6 Bl	567	5.0 Oy	576	11.3 Ar	577	12.5 En	566	10.9 Ht
534	9.5 Bl	534	7.9 Ht	574	5.3 Oy	576	11.7 Gy	**W LEO**		566	10.8 En
539	8.9 Ht	537	7.6 Dk	**RZ CAR**		581	11.2 B	104814		577	11.1 En
541	8.9 En	539	6.9 Ht	*103270*		581	11.0 Wd	503	13.1 Bm	**AD CEN**	
543	8.6 Sl	541	6.9 En	500	12.7 En	581	11.0 Hf	505	13.4 Ch	*114858*	
545	8.7 Ht	543	6.8 Sl	539	13.6 Ht	585	11.4 Ar	515	13.4 Bm	533	9.5 Ht
551	8.4 Ht	544	7.0 Dk	541	13.6 En	588	11.7 Gy	533	13.7 Br	539	9.4 Ht
555	8.8 Bl	545	6.8 Ht	551	13.1 Ht	588	11.6 Sz	545	14.2 Br	545	9.3 Ht
560	8.6 Ht	547	6.7 En	563	12.9 Ht	589	11.8 Pt	592	13.5 GC	551	9.3 Ht
566	8.8 Ht	551	6.5 Ht	566	12.7 En	589	11.6 Cy	**RS CAR**		563	9.5 Ht
566	8.5 En	555	6.4 Bl	568	12.2 Ht	594	11.8 B	*110361*		568	9.4 Ht
577	8.9 En	556	6.3 Dk	577	11.0 En	595	12.2 SR	543	12.3 Sl	**W CEN**	
V LEO		560	6.2 Ht	**R UMA**		**V HYA**		577	12.3 En	*115058*	
095421		566	6.2 Ht	103769		*104620*		**S LEO**		516	11.2 En
505	13.8 Ch	566	6.1 En	512	8.2 Ch	501	8.0 Ch	110506		533	12.6 Ht
533	13.7 Br	577	6.0 En	530	8.8 Cy	512	8.0 Ch	505	12.8 Ch	534	12.4 Bl
545	14.0 Br	**U UMA**		530	8.8 Sq	515	8.0 Ch	533	14.0 Br	542	13.0 En
563	13.4 B	100860		531	9.4 Hi	515	7.9 En	545	13.8 Br	555	12.6 Bl
565	13.5 GC	510	6.4 Ch	532	8.9 Ch	519	8.0 Ch	589	12.2 Cy	568	12.6 Ht
591	12.5 GC	543	6.4 Lt	536	8.8 Je	530	8.0 Ch	589	12.0 Pt	577	12.6 En
592	12.5 GC	555	6.4 Lt	536	9.4 Ah	530	7.4 Ko	591	12.0 B	**Z UMA**	
594	12.2 B	564	6.5 Lt	541	9.6 Hf	530	7.3 BH	591	11.8 GC	115158	
RR CAR		570	6.5 Lt	542	9.7 Br	534	7.7 Bl	592	11.4 GC	530	8.6 Rb
095458		572	6.8 Hr	543	9.7 Ah	539	7.9 Rc	**RY CAR**		532	8.9 Rb
505	7.0 En	573	6.8 Hr	544	10.0 Ra	539	7.3 BH	*111561*		574	8.7 Rb
515	7.3 En	579	6.4 Lt	544	10.0 Sx	542	7.7 Ko	515	13.1 En	595	8.1 Wy
530	7.4 Ht	590	6.5 Lt	545	10.6 Cy	542	7.3 L	537	13.1 Bl	**R COM**	
534	7.4 Ht	**Z CAR**		545	10.2 Ch	542	7.8 En	545	13.1 Ht	115919	
539	7.3 Ht	*101058a*		545	9.8 Hi	547	8.0 Rc	566	13.1 En	505	8.3 Ch
541	7.8 En	500	11.6 En	546	10.2 Wx	548	7.5 Jo	577	13.1 En	533	8.9 Ch
545	7.6 Ht	505	11.6 En	549	10.2 Sq	555	7.6 Bl	**RS CEN**		533	8.7 Br
551	7.7 Ht	515	12.0 En	549	10.5 Wg	555	7.0 L	*111661*		541	9.0 Hf
560	7.8 Ht	533	12.2 Ht	553	10.5 Sz	556	7.4 Jo	500	8.8 En	545	9.2 Cy

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
R COM		SU VIR		R CRV		R CRV		SS VIR		Y VIR	
115919		120012		*121418*		*121418*		122001		*122803*	
553	8.7 Wa	589	12.6 Pt	559	8.1 Lu	581	8.1 Hf	575	8.5 Hf	569	13.6 Wa
558	9.6 Hf	590	13.1 Wp	559	8.5 Je	581	8.4 Fs	575	8.4 Sh	569	13.5 Wp
559	9.5 Jo	590	13.1 Wa	560	8.2 Si	584	8.7 Wx	577	7.8 Ko	588	13.4 FO
563	9.5 Wa	591	13.3 Wa	560	8.1 Hq	585	8.8 Ba	578	8.1 Md	588	13.5 Ar
563	9.5 Wp	591	13.3 Wp	560	7.9 Sq	588	8.9 Wp	581	8.4 Hf	589	13.0 My
563	9.9 Hz	594	13.0 My	561	7.8 Wx	588	8.6 Ar	581	8.3 Wd	594	13.5 B
563	9.6 Jo	596	13.4 Wa	561	8.1 Oy	588	8.8 Fi	588	8.3 Hf	597	13.2 My
564	9.5 So	597	13.5 My	562	7.9 Kn	588	8.7 Wa	588	8.5 Sz	602	12.8 My
565	9.6 Cy	602	13.4 My	563	8.0 Mc	588	8.4 Kn	590	8.0 Kn	U CEN	
566	9.8 Jo	T VIR		563	7.9 Kn	588	8.6 Hf	590	8.3 Sh	*122854*	
569	9.6 Wa	*120905*		563	8.1 Wp	589	8.7 Je	594	8.0 B	516	12.3 En
570	10.4 Jo	538	12.5 Rb	563	8.1 Mc	589	8.6 Pt	594	7.8 Jo	537	12.4 Bl
570	9.4 Hf	543	13.8 L	563	8.3 Sx	590	8.9 Sh	595	7.6 Wh	545	12.3 Ht
576	9.9 Wa	566	12.5 Wu	563	8.0 Wa	590	9.4 Mc	596	7.6 Jo	551	12.3 Ht
576	10.0 Wp	588	14.0 Ar	563	8.1 Jo	593	8.5 Wa	600	7.5 Jo	563	10.8 Ht
585	9.9 Hf	593	13.8 B	564	8.3 Mc	593	8.6 Wp	600	7.7 Kn	566	10.3 En
592	10.7 Wp	R CRV		564	8.5 Oy	594	8.9 B	603	7.6 Jo	568	10.4 Ht
595	10.8 Wy	*121418*		564	7.8 Pt	595	9.2 Wy	T CVN		577	9.6 En
596	10.5 Jo	505	11.0 Bm	565	8.0 Cy	596	8.9 Jo	*122532*		T UMA	
600	10.6 Jo	513	10.2 Bm	565	8.0 Lu	596	8.8 Wa	505	10.5 Ch	*123160*	
602	11.4 Fi	522	9.2 Bm	565	8.1 Ba	596	9.1 Ba	511	10.8 Ch	509	11.4 Ch
603	10.8 Jo	524	8.8 Sl	565	8.0 Wd	598	9.6 Mc	515	11.0 Ch	515	11.6 Ch
SU VIR		531	8.3 BH	565	8.1 Hz	599	8.9 Wa	530	11.2 Ch	534	12.4 Br
120012		533	8.3 Pa	565	7.7 Mi	600	9.7 Mc	532	11.1 Br	540	12.2 Pk
505	9.5 Ch	534	8.1 Sq	566	8.1 Sx	600	9.2 Jo	534	11.5 Br	559	12.4 Pk
533	10.3 Ch	535	8.2 Pa	566	8.1 Hf	601	9.1 Kn	537	11.0 Cv	564	12.7 Pt
536	10.2 Cy	536	7.5 Se	566	8.2 Sh	603	9.4 Jo	545	11.6 Br	565	12.7 Wd
538	10.0 Br	536	8.5 Je	566	8.1 Wd	RY UMA		548	12.2 Br	569	12.6 Ra
543	10.9 L	536	8.2 Cy	566	8.0 Jo	121561		549	11.5 Wa	581	12.3 Hf
545	11.1 Cv	537	7.8 Wx	566	8.3 Je	543	7.6 Lt	549	11.6 Wp	581	12.3 Wd
549	10.9 Wa	538	8.0 Lu	566	8.3 Lu	555	7.5 Lt	556	11.5 Wp	589	12.4 Pt
549	11.1 Wp	538	8.1 Hf	567	8.5 Si	566	7.5 Lt	556	11.4 Wa	596	12.1 Jo
555	11.5 L	538	8.1 Sh	569	7.8 We	571	7.2 Lt	558	11.6 Br	599	12.0 Gy
556	11.4 Wa	540	8.1 Pa	569	8.2 Wp	576	7.1 Lt	559	10.8 Jo	600	11.9 Jo
556	11.5 Wp	544	7.8 Sl	569	8.4 Wa	586	7.3 Lt	563	11.5 Wa	603	11.3 Hz
561	11.5 My	545	8.0 Cy	570	8.2 Jo	SS VIR		563	11.3 Wp	R VIR	
563	11.8 Wa	546	8.1 Si	570	8.1 Hf	122001		564	11.4 Pt	*123307*	
563	11.7 Wp	546	7.8 Wx	571	8.6 Mc	550	8.5 Ko	565	11.1 Jo	509	11.6 Ch
564	11.6 So	548	8.3 Lu	573	8.2 Hz	540	9.0 Hf	565	11.0 Cv	535	9.2 Pa
564	11.8 Pt	548	8.4 Fs	573	8.2 Mi	540	8.1 Be	568	11.3 Rc	536	9.0 Ah
565	11.8 Cy	548	7.9 Jo	574	8.1 Sx	542	8.0 Ko	570	11.4 Jo	540	8.8 Hf
565	12.0 My	549	7.7 Wp	574	8.5 Wx	543	8.0 Jo	575	11.0 Cy	543	9.0 L
566	12.2 Wa	549	7.8 Sq	574	8.3 Jo	543	7.9 L	576	11.0 Jo	543	8.7 Ah
566	12.3 Wp	549	7.8 Wa	574	8.1 Ba	551	8.4 B	589	10.4 Cy	543	8.9 Pa
569	12.0 Wp	550	8.2 Lu	574	8.2 Oy	553	8.3 Sz	589	11.1 Pt	544	8.0 Je
569	12.1 Wa	550	8.0 Oy	574	8.0 Kn	555	7.7 L	596	10.8 Wa	545	8.9 Rc
574	12.1 My	550	8.2 Fs	574	8.3 Lu	557	7.8 Ko	596	10.6 Jo	546	7.8 Si
575	12.1 Cy	550	8.0 Wd	575	8.2 Wd	557	7.6 Jo	600	11.0 Jo	547	8.9 Ba
576	12.5 Wp	551	7.9 B	575	8.4 Cy	558	9.1 Hf	601	10.6 Wa	548	9.0 Lu
576	12.5 Wa	553	7.9 Hf	575	8.3 Sq	563	7.6 Jo	603	10.7 Jo	548	9.0 Fs
581	12.7 Wp	556	8.0 Wd	575	8.2 Sh	564	9.0 So	Y VIR		548	8.9 Ra
581	12.4 Fi	557	8.1 Lu	576	8.2 Wp	566	7.7 Jo	*122803*		549	8.6 Ah
581	13.6 Wa	557	8.1 Wd	576	8.4 Wa	567	8.7 Md	505	10.8 Bm	549	8.8 Rc
588	13.4 Wa	557	7.8 Jo	577	8.5 Hz	570	8.0 Jo	511	11.1 Ch	549	8.6 Wa
588	12.9 Fi	558	8.1 Lu	577	8.3 Jo	570	8.7 Hf	513	11.5 Bm	552	8.6 Ah
588	13.2 Wp	558	7.8 Ba	580	8.4 B	573	8.5 Mi	522	12.0 Bm	553	8.4 Ah
589	12.6 My	559	8.1 Wd	581	8.2 Wd	574	7.7 Jo	543	12.9 L	555	8.1 L
		559	8.0 Jo	581	8.4 Lu	575	8.5 Hf	565	13.3 B	556	8.5 Hf

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
R VIR		R VIR		RS UMA		RU VIR		U OCT		S VIR	
123307		123307		123459		124204		*131283*		*132706*	
556	8.5 Fs	594	7.1 Jo	595	8.5 Wy	588	13.5 FO	539	11.8 Ht	543	13.4 L
556	8.6 Wd	594	8.0 B	596	8.2 Jo	591	13.4 GC	541	11.4 En	563	12.3 Ht
557	8.6 Lu	596	7.3 Jo	599	8.5 Gy	592	13.4 GC	545	11.4 Ht	563	12.3 Jo
558	8.3 Ba	596	7.0 Ba	600	8.8 Mc	U VIR		555	10.6 Bl	565	12.0 Jo
558	8.0 Ah	598	7.3 Rc	600	8.6 Jo	*124606*		563	10.5 Ht	566	12.8 Wd
558	8.2 Jo	598	7.4 Mc	603	8.6 Hz	511	12.8 Ch	567	10.2 En	566	12.5 Sh
558	8.0 Je	600	7.5 Mc	603	8.7 Jo	536	10.3 Ah	577	9.9 En	566	12.8 Hf
560	8.2 Rc	600	7.5 Jo	S UMA		538	10.8 Br	V CVN		566	12.5 En
561	7.7 Sq	601	7.5 Rc	123961		540	10.9 Hf	131546		568	12.1 Ht
561	8.2 Oy	603	7.7 Jo	509	8.8 Ch	540	10.5 Wu	564	6.9 Lt	568	12.0 Pk
562	8.2 Mc	RS UMA		515	9.0 Ch	543	10.3 L	567	6.9 Lt	570	12.0 Jo
563	8.0 Rc	123459		529	9.7 Ch	548	10.3 Wu	570	6.9 Lt	574	12.3 Pk
563	7.6 Jo	505	13.9 Bm	530	10.0 Sq	556	9.0 Wd	576	7.0 Lt	576	11.7 Jo
563	7.4 Sx	509	13.3 Ch	534	9.7 BH	556	9.1 Hf	586	6.9 Lt	576	12.1 Ra
564	8.0 Mc	513	13.3 Bm	534	9.6 Ah	558	9.1 Jo	V VIR		577	12.2 Wu
564	7.4 Oy	522	13.6 Bm	536	9.9 Ah	559	8.9 Lt	*132202*		588	11.4 Ar
564	7.6 Pt	534	12.6 Br	540	10.1 Rc	561	8.7 Sq	511	8.5 Ch	589	11.3 Ar
564	7.5 Ah	537	12.6 Cy	541	10.4 Hf	563	8.8 Jo	537	10.4 Cv	589	11.4 Di
565	7.8 Ba	543	12.0 Pk	543	10.8 Pk	564	8.9 Ah	540	10.3 Hf	589	11.5 B
565	7.9 Rc	543	11.3 Rc	543	10.3 Ah	564	8.7 Pt	543	11.4 L	589	11.2 Pt
565	8.0 Lu	544	11.9 Ra	544	10.0 Sx	565	8.5 Lu	593	14.5 FO	593	11.7 FO
566	7.3 Sx	546	11.6 Ry	544	10.4 Ra	566	9.1 Wu	R HYA		595	11.8 Wy
566	7.3 Jo	548	11.7 Bn	549	10.0 Wg	566	8.6 Ra	*132422*		602	11.1 Hz
566	7.7 Fs	549	10.0 Wg	553	10.5 Sz	566	8.7 Hi	511	7.2 Ch	RV CEN	
568	7.7 Rc	555	10.7 Wd	555	10.6 Wd	566	8.5 Jo	515	7.5 Ch	*133155*	
569	7.5 Wa	556	10.2 Jo	556	11.0 Jo	567	8.4 Lt	516	7.4 En	516	8.2 En
569	8.0 Wp	556	11.8 Wp	559	11.6 Jo	569	8.8 Ah	520	7.4 Ch	533	8.1 Ht
569	7.2 Ah	556	11.8 Wa	559	11.3 Pk	570	8.5 Hf	533	7.3 Ht	534	7.8 Bl
569	7.6 Rc	557	10.5 Bn	560	11.3 Wx	570	8.3 Lt	534	7.3 Bl	537	7.8 Bl
570	7.1 Jo	558	10.7 Hf	563	10.8 So	570	8.3 Jo	539	7.5 En	539	8.5 En
570	7.2 Hf	559	9.7 Jo	563	10.7 Mc	573	8.7 Ah	539	7.1 Ht	539	8.4 Ht
571	7.8 Mc	559	10.2 Pk	563	11.5 B	575	8.5 Sh	540	7.3 Bl	542	8.0 En
572	7.6 Je	563	9.9 So	564	11.1 Pt	575	8.3 Wd	542	7.3 En	545	8.2 Ht
573	7.2 Mi	564	10.0 Pt	565	11.2 Wd	576	8.0 Lt	545	7.0 Ch	551	8.0 Ht
573	7.0 Ah	565	9.6 Cy	566	11.5 Kg	576	8.3 Ra	545	6.6 Ht	556	7.8 Bl
573	7.2 Rc	565	9.9 Wd	569	11.8 Ra	577	8.0 Sq	546	6.4 L	563	8.0 Ht
574	7.3 Oy	566	9.6 Kg	570	11.2 Wa	581	8.4 Fs	551	6.4 Ht	567	7.7 En
574	7.0 Rc	568	9.2 Ry	570	11.3 Jo	581	8.2 Lu	556	6.0 Bl	568	7.8 Ht
574	7.0 Sx	569	8.8 Ra	573	11.5 Ah	585	8.2 Hf	557	6.2 Jo	T UMI	
574	7.0 Ba	570	8.7 Jo	574	11.7 Jo	588	8.7 Sx	563	5.5 Jo	133273	
575	6.9 Sh	570	9.2 Hf	576	11.5 Gy	589	8.1 Pt	563	6.2 Ht	534	14.2 Br
575	6.8 Wd	572	8.7 Wx	581	11.9 Wd	590	8.3 Sh	565	5.8 Pt	T CEN	
576	6.9 Sq	572	9.0 Bn	581	11.9 Hf	590	7.8 Lt	565	6.2 Ko	*133633*	
576	7.0 Ra	574	8.8 Jo	588	11.5 Sz	596	7.9 Jo	566	5.5 Jo	516	6.3 En
576	7.2 Jo	575	8.7 Cy	589	12.1 Pt	600	8.0 Jo	567	5.9 En	524	6.6 Sl
576	6.9 Rc	576	8.8 Gy	589	11.8 Wx	603	8.3 Jo	568	5.7 Ht	533	7.9 Ht
578	6.9 Rc	576	8.8 Hz	595	11.8 Wy	RV VIR		577	5.3 En	534	7.8 Bl
581	6.7 Ah	577	8.6 Sq	596	11.3 Jo	*130212*		589	4.6 Ko	538	8.5 Sl
583	7.1 Rc	577	9.2 Wu	599	12.4 Gy	511	13.3 Ch	589	5.0 Pt	539	8.6 Ht
584	6.8 Ah	578	8.8 Ry	600	11.2 Mc	543	12.8 L	600	4.5 Jo	544	8.6 Sl
585	7.3 Ba	581	8.6 Hf	600	11.3 Jo	588	11.5 FO	603	4.5 Jo	545	8.8 Ht
585	6.9 Hf	581	8.6 Wd	RU VIR		600	11.6 Sf	S VIR		545	9.0 En
587	7.2 Rc	586	8.5 Ry	124204		U OCT		*132706*		551	8.8 Ht
588	7.0 Sz	586	8.6 Gy	538	13.6 Br	*131283*		511	13.0 Ch	554	8.3 Sl
589	7.1 Je	588	8.5 Hf	543	14.3 L	515	12.9 En	514	13.0 Ch	556	7.7 Bl
589	7.3 Pt	589	8.5 Cy	566	13.4 GC	533	11.9 Ht	516	12.4 En	560	7.1 Ht
590	7.1 Mc	589	8.7 Wx	569	13.9 Wa	533	12.1 En	521	13.2 Ch	564	7.1 Lt
593	7.3 Rc	589	8.0 Pt	569	13.8 Wp	537	11.9 Bl	539	12.3 Ht	566	6.7 Ht

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
T CEN			T APS			R CEN			U UMI			V BOO			R CAM		
133633			*134677*			*140959*			141567			142539a			142584		
567	6.9	Lt	551	10.2	Ht	512	6.0	Dk	575	11.4	Kn	543	7.8	Jo	545	8.2	Cy
567	6.6	En	556	10.3	Bl	516	5.9	En	588	11.5	Sz	544	7.9	Wx	548	8.8	Br
569	7.0	Lt	563	10.8	Ht	517	5.9	Dk	589	11.5	Pt	545	8.2	Cy	550	8.5	Jo
572	7.0	Lt	567	11.2	En	523	5.9	Dk	589	11.7	Cy	545	7.8	Ch	550	8.6	Oy
576	6.7	Lt	568	10.9	Ht	524	5.8	Sl	589	11.9	Kn	549	7.8	Sq	556	8.4	Jo
580	6.7	Lt	577	11.4	En	531	5.8	Dk	600	11.2	Jo	550	7.7	Jo	557	8.6	Wd
595	6.5	Lt	RR VIR			533	6.1	Ht	603	11.5	Jo	552	7.8	Oy	558	8.7	Hi
RT CEN			*135908*			533	6.0	En	S BOO			553	8.1	Hf	561	8.7	Oy
134236			543	13.0	L	534	6.2	Bl	141954			553	8.0	Ra	563	8.6	Jo
516	9.3	En	565	12.8	Pt	537	5.7	Dk	511	13.4	Ch	555	7.8	Sh	564	8.8	Oy
533	9.6	Ht	570	14.3	Wa	538	5.9	Sl	514	13.2	Ch	556	7.8	Jo	565	9.3	Cy
534	9.4	Bl	593	14.5	FO	539	6.1	Ht	538	12.2	Br	559	7.8	Sx	566	8.6	Jo
539	9.6	Ht	Z BOO			541	6.0	En	543	11.9	Jo	559	7.4	Pk	570	8.5	Jo
545	9.7	Ht	140113			544	5.8	Dk	546	11.5	Ch	560	8.0	Sq	574	8.8	Oy
545	10.0	En	538	12.5	Br	544	6.0	Sl	548	11.5	Jo	561	7.7	Wx	575	8.8	Wd
551	9.8	Ht	546	11.4	Ch	545	6.1	Ht	558	11.2	Jo	561	7.7	Oy	575	9.1	Cy
556	9.9	Bl	548	11.4	Br	545	5.9	En	562	10.5	B	563	7.7	Jo	577	9.0	Br
560	10.3	Ht	562	9.8	B	551	6.3	Ht	563	11.0	Wd	563	7.2	Mc	588	9.8	B
566	10.6	Ht	565	10.5	Wa	554	5.9	Sl	563	11.0	Jo	564	7.4	Mc	589	9.8	Cy
567	10.4	En	565	10.6	Wp	556	5.9	Dk	565	10.8	Pt	564	8.1	Oy	596	9.0	Jo
R CVN			566	10.0	GC	556	6.3	Bl	566	10.5	Ra	565	8.0	Pt	600	9.4	Jo
134440			570	9.8	FO	560	6.1	En	567	10.4	Br	566	7.9	Sx	603	9.5	Jo
511	10.4	Ch	591	9.5	GC	563	6.4	Ht	569	10.8	Jo	566	7.6	Jo	R BOO		
534	11.9	Pk	593	10.0	FO	567	6.1	En	569	10.4	Ra	569	7.8	We	143227		
534	11.4	Ah	597	9.6	My	568	6.6	Ht	570	10.3	Hf	570	7.7	Sf	511	9.0	Ch
546	11.6	Ch	602	9.8	My	U UMI			574	10.4	Jo	570	7.5	Jo	528	7.6	Ch
561	12.2	Pk	Z VIR			141567			576	10.3	Sq	570	7.8	Wa	530	7.9	Rb
563	12.5	Kn	*140512*			511	9.0	Ch	585	9.8	Hf	570	7.9	Hf	533	7.1	Pk
563	12.2	B	510	10.9	Ch	531	9.7	Br	588	9.7	Gy	570	8.4	Cy	535	7.4	Kp
563	12.3	Ra	543	10.2	L	533	9.7	Pk	589	9.4	B	572	7.6	Mc	535	8.0	Ah
564	12.5	Kn	546	10.5	Ch	536	9.8	Ah	589	9.1	Pt	574	7.8	Ra	535	7.6	Sq
565	12.3	Wa	562	10.8	B	537	10.9	Cy	589	9.4	Ar	574	8.0	Wx	536	7.4	Se
565	12.3	Wp	565	11.4	Pt	538	9.7	Sh	596	8.9	Jo	574	8.1	Oy	536	7.4	Kp
565	12.1	Pt	569	11.5	Wp	538	10.0	Sq	596	9.4	Hf	575	7.8	Sx	536	7.9	Ah
566	12.4	Kn	569	11.6	Wa	538	9.7	Hf	599	8.9	Gy	575	7.9	Sq	537	7.2	Kp
570	12.5	Kn	570	11.4	FO	543	9.9	Jo	600	9.3	Jo	575	7.8	Sh	538	7.2	Kp
578	12.1	Ra	576	11.9	Wp	543	10.8	Ah	603	9.4	Jo	576	7.7	Jo	538	7.8	Hf
589	12.3	Kn	576	12.1	Wa	544	10.6	Ra	RS VIR			581	8.2	Cy	538	7.6	Sh
589	12.1	Pt	589	12.6	B	545	10.3	Ch	142205			582	8.1	B	540	7.3	Kp
595	11.8	Wy	593	13.6	FO	550	10.2	Jo	505	13.2	Bm	585	8.0	Hf	541	7.4	Kp
596	12.0	Jo	RU HYA			553	10.6	Sz	511	13.0	Ch	587	8.0	Wh	542	7.2	Kp
600	11.8	Jo	*140528*			556	10.5	Wd	513	12.9	Bm	588	8.2	Wx	543	7.2	Kp
603	12.0	Jo	516	10.8	En	556	10.5	Hf	522	13.4	Bm	589	8.2	Pt	543	7.7	Ah
RX CEN			533	8.5	Ht	558	10.5	Jo	543	13.5	Bm	590	8.0	Mc	543	7.1	Jo
134536			534	8.7	Bl	558	10.9	Br	546	13.4	Ch	590	8.3	Sh	544	7.5	Wx
516	13.1	En	539	8.0	Ht	560	10.6	Ri	567	13.6	Br	596	8.0	Jo	545	7.3	Ch
537	13.1	Bl	545	8.0	Ht	560	10.7	Cy	570	13.6	FO	596	8.6	Hf	546	7.1	Si
545	13.1	Ht	545	7.9	En	560	10.5	Sq	570	13.3	Wa	600	8.2	Jo	546	7.3	Kp
551	13.1	Ht	551	7.9	Ht	561	10.5	Pk	571	13.1	Md	600	8.8	Sf	548	7.7	Kp
568	13.1	Ht	556	7.9	Bl	562	10.8	B	593	13.1	FO	603	8.5	Jo	549	7.4	Kp
T APS			563	8.0	Ht	563	10.7	Jo	V BOO			R CAM			549	7.7	Ah
134677			567	7.9	En	563	11.1	Kn	142539a			142584			549	7.5	Sq
515	9.0	En	568	7.8	Ht	565	11.3	Kn	511	8.8	Ch	501	8.8	Ch	550	7.2	Kp
533	9.5	Ht	R CEN			565	11.0	Pt	528	8.5	Ch	530	8.5	Ch	550	7.5	Jo
534	9.5	Bl	*140959*			566	10.7	Hz	533	7.9	Pk	531	8.4	Hi	552	7.8	Ah
539	9.5	Ht	500	6.4	Dk	570	10.6	Wa	534	7.8	Sq	534	8.2	Br	553	7.9	Ah
542	9.1	En	506	6.4	Dk	570	11.0	Cy	542	8.1	Wd	542	8.5	Br	553	7.6	Hf
545	9.9	Ht	510	5.9	Sl	572	11.5	Hi	542	8.1	Hf	543	8.4	Jo	553	7.7	Sz

Variable Star Observations Received During May and June, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
R Boo		**S Lup**		**RT Lib**		**RS Lib**		**S UMi**		**RR CrB**	
143227		*144646a*		*150018*		*151822*		153378		153738	
553	8.0 Ra	567[12.1	En	574	11.0 Jo	563	7.6 Ht	512	9.2 Ch	586	8.0 Lt
555	7.2 Kp	**X Lup**		589	11.4 Pt	567	7.6 En	530	9.5 Ko	595	7.9 Lt
556	7.5 Jo	*144646b*		593	11.4 FO	570	7.8 Jo	538	9.5 Sq	**Z Lib**	
557	8.0 Ah	516[12.1	En	596	10.5 Jo	574	8.0 Jo	540	9.4 Hf	*154020*	
558	8.1 Ah	539[12.1	Ht	600	10.4 Jo	593	9.5 FO	542	8.7 Ko	540[12.7	Bl
559	8.3 Sx	545[12.1	En	**T Lib**		**RU Lib**		543	8.4 Jo	**R CrB**	
559	7.6 Pk	551[12.1	Ht	*150519*		*152714*		544	9.6 Ra	154428	
560	8.6 Sq	567[12.1	En	514	11.8 Ch	514	11.9 Ch	545	9.6 Ch	511	6.4 Ch
561	7.3 Wx	**U Boo**		545	11.3 L	545	10.1 L	556	8.7 Wd	514	6.3 Ch
563	7.7 Jo	144918		565	12.0 Pt	546	10.1 Hf	556	9.2 Hf	520	6.4 Ch
563	8.3 Wd	511	10.2 Ch	588	13.1 B	547	9.5 Wx	557	9.5 Ko	529	6.3 Rb
564	8.3 Ah	543	10.9 Jo	593	13.1 FO	560	9.3 Wx	558	8.7 Jo	529	6.4 Kp
565	7.6 Hz	545	10.4 Cy	**Y Lib**		561	9.1 Oy	559	9.5 Sx	530	6.4 Kp
565	8.0 Pt	546	10.9 Ch	*150605*		563	8.9 Jo	562	8.6 Sq	530	6.0 Pk
566	7.7 Jo	550	10.9 Jo	565	12.9 Cy	564	9.2 Oy	565	8.7 Pt	530	6.2 Rb
566	8.0 Sx	559	10.7 Cy	565	12.8 My	565	9.3 Hf	566	8.8 Jo	530	6.0 Ko
569	8.5 Ah	562	10.4 B	565	13.1 Pt	565	9.4 Pt	569	9.7 Ra	531	6.0 Pk
570	8.1 Hf	566	10.8 GC	589	13.6 Pt	569	9.0 Ra	570	8.8 Jo	532	6.0 L
570	7.8 Wa	566	10.8 Jo	593	13.9 FO	570	8.6 Jo	570	9.4 Sf	532	6.6 Kp
570	7.7 Jo	570	11.2 Wa	**S Lib**		570	9.3 Hf	570	9.1 Hf	532	6.2 Se
573	8.6 Ah	589	10.8 B	*151520*		573	9.3 Mi	575	9.5 Sx	532	6.0 Pk
574	8.7 Ah	591	10.7 GC	514	9.6 Ch	574	8.9 Wx	576	9.3 Jo	532	6.5 Rb
574	7.7 Hz	592	10.8 GC	545	11.6 L	574	8.8 Jo	576	9.8 Ko	533	6.0 L
574	8.3 Ra	593	10.6 Ri	565	12.2 Pt	574	8.8 Oy	577	8.6 Sq	533	6.6 Kp
574	8.0 Wx	603	10.2 Jo	573	12.0 Mi	588	8.3 Wx	582	9.8 B	533	6.0 Pk
575	8.6 Sh	**Y Lup**		593	10.4 FO	588	8.5 Hf	585	9.9 Hf	534	6.0 Pk
575	8.0 We	*145254*		597	10.0 Jo	588	9.0 B	589	9.5 Pt	534	6.7 Ah
576	8.5 Sx	516	10.3 En	600	9.8 Jo	589	8.2 Ar	593	9.8 Sf	534	6.1 Cy
576	7.8 Jo	533	10.8 Ht	**S Ser**		589	8.3 Pt	596	10.3 Hf	534	6.2 Ch
576	8.6 Sq	534	10.8 Bl	151714		590	8.8 Sx	**U Lib**		534	6.2 Ru
581	8.8 Ah	539	11.3 Ht	511[13.0	Ch	590	8.5 Sh	*153620a*		535	6.5 Kp
584	8.7 Ah	545	12.1 Ht	546[13.0	Ch	596	8.5 Jo	540	9.5 Bl	535	6.4 Rb
585	8.7 Hf	545	11.7 En	569	13.8 Br	600	8.0 Jo	545	9.4 L	535	6.1 Ko
588	8.4 Wx	551	12.4 Ht	589	13.5 Pt	**R Nor**		556	9.2 Bl	535	6.2 Ar
588	8.6 Ar	556	11.6 Bl	591	13.4 GC	*152840*		563	9.3 Jo	535	6.5 Ah
588	8.9 Ah	563	12.7 Ht	**S CrB**		533	12.5 Ht	576	9.4 Jo	535	6.0 Cy
588	8.7 Sz	567	12.4 En	151731		537	12.4 Bl	**T Nor**		536	6.2 Se
588	9.2 Kp	568	12.9 Ht	511	11.7 Ch	539	12.5 Ht	*153654*		536	6.4 Rb
589	8.8 Ar	**S Aps**		543	12.3 L	545	12.6 Ht	533	11.7 Ht	536	6.0 Ko
589	9.2 Pt	*145971*		545	11.9 Ch	545	12.4 En	539	11.5 Ht	536	6.2 Ar
590	9.2 Sh	510	10.4 Sl	553	12.6 Ra	551	12.6 Ht	545	10.8 Ht	536	6.6 Ah
593	9.9 FO	516	10.2 En	561	10.5 Sq	563	12.8 Ht	545	10.5 En	536	6.5 Kp
596	9.4 Hf	524	10.1 Sl	565	12.6 Pt	567	13.3 En	551	10.6 Ht	536	6.0 Je
596	9.6 Hz	533	10.4 Ht	567	12.9 Br	568	12.8 Ht	563	9.9 Ht	536	6.3 Cy
596	9.0 Jo	533	10.1 En	573	10.5 Bc	**X Lib**		567	8.8 En	536	6.1 Si
600	9.5 Jo	534	10.2 Bl	576	10.5 Sq	*153020*		568	8.6 Ht	537	6.5 Rb
603	9.8 Jo	539	10.3 Ht	589	13.1 Ar	540	12.5 Bl	**RR CrB**		537	6.7 Ah
V Lib		544	10.2 Sl	589	12.6 Pt	545	12.6 L	153738		537	6.6 Kp
143417		545	10.0 Ht	**RS Lib**		593	11.4 FO	537	8.0 Lt	537	6.1 Cy
545	13.4 L	545	10.0 En	*151822*		**W Lib**		540	7.8 Lt	538	6.2 Se
570[13.5	FO	551	10.1 Ht	533	9.5 Ht	*153215*		543	7.5 Lt	538	6.3 Rb
590[13.5	B	554	9.9 Sl	534	8.7 Bl	540	11.9 Bl	545	7.5 Lt	538	6.4 Kp
S Lup		556	10.0 Bl	539	8.3 Ht	545	11.9 L	555	7.4 Lt	540	6.1 Hf
144646a		563	10.1 Ht	545	8.0 L	556	11.8 Bl	564	7.7 Lt	540	6.4 Rb
516	12.4 En	566	10.2 En	545	8.1 Ht	563	10.4 Jo	567	7.9 Lt	540	6.1 Ko
533[12.1	Ht	567	10.1 En	545	8.5 En	570	10.6 Jo	570	7.9 Lt	540	6.5 Kp
545[12.1	En	568	10.1 Ht	551	7.7 Ht	588	13.2 B	576	7.7 Lt	541	6.6 Rb
551[12.1	Ht			556	7.3 Bl	589	13.0 Ar	580	7.8 Lt	541	6.5 Kp

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.Obs.	R CrB 154428	J.D.Est.Obs.	R CrB 154428	J.D.Est.Obs.	R CrB 154428	J.D.Est.Obs.	R CrB 154428	J.D.Est.Obs.	R CrB 154428	J.D.Est.Obs.	R CrB 154428
541	6.0 Si	552	6.2 Oy	561	6.0 Ar	569	6.0 Jo	576	6.1 Gy	588	6.0 Pk
542	6.1 Ko	552	6.8 Ah	562	6.3 Wa	569	6.0 Pt	576	6.1 Ko	588	6.1 Hf
542	6.4 Kp	552	6.2 Ra	562	6.2 Wp	569	6.2 Ar	576	6.2 Cy	588	6.1 Gy
543	6.1 L	552	6.3 Cy	562	6.2 Cy	569	6.0 Si	576	6.2 Pt	588	6.1 Ah
543	6.2 Se	552	6.1 Ch	562	6.0 Pt	569	6.2 Rb	576	6.1 Rc	588	6.1 Sz
543	6.1 Pk	553	6.1 Ba	562	6.3 Rb	569	6.1 Ko	577	6.0 Jo	588	6.2 Gw
543	6.7 Ah	553	6.2 Hf	562	5.9 Ko	569	6.3 Cy	577	6.3 Ar	588	6.0 Pt
543	6.5 Kp	553	6.5 Rb	563	6.2 Sx	569	6.2 Wp	577	6.3 Wa	588	6.5 Fi
543	6.0 Ra	553	6.1 Sz	563	6.1 Ra	569	6.2 Ah	577	6.1 Si	589	6.2 Ar
543	6.2 Jo	553	6.8 Ah	563	5.8 Rc	569	6.1 Rc	577	6.1 Ko	589	6.0 Wa
543	6.4 Pt	553	6.0 Wa	563	6.3 Wa	570	6.0 Wa	577	6.2 Cy	589	6.2 Se
543	6.2 Ru	553	6.2 Wp	563	6.1 Cy	570	6.1 Si	578	6.1 Si	589	6.0 Kg
543	6.0 Rc	553	6.3 Cy	563	6.0 Jo	570	6.1 Ko	578	6.2 Rb	589	6.1 Si
544	6.3 Ko	554	6.5 Rb	563	6.2 SR	570	6.1 Hf	578	6.1 Ko	589	6.0 Lr
544	6.2 Ar	554	6.1 Ar	563	6.0 Ar	570	6.3 Cy	578	6.3 Cy	589	6.3 Rb
544	6.2 Ra	555	6.1 Ba	563	6.1 Si	570	6.2 Jo	578	6.4 Pt	589	6.2 Kp
544	6.1 Si	555	6.1 Ar	563	6.0 Ko	570	5.8 Rc	578	6.1 Rc	589	6.0 Ko
544	6.5 Pt	555	6.7 Ah	564	6.2 Wp	571	6.2 Ar	579	6.2 Cy	589	6.1 Pk
545	6.1 L	555	6.6 Kp	564	5.9 Pt	571	6.2 Se	580	6.0 Ra	589	6.1 Lu
545	6.2 Ar	555	6.2 Wa	564	6.1 Si	571	6.3 Cy	580	6.2 Ar	589	6.2 Gw
545	6.8 Ah	555	6.2 Wp	564	6.0 Ko	572	6.0 Hr	580	6.3 Pt	589	6.0 Pt
545	6.6 Cy	555	6.1 Fs	564	6.4 Ah	573	6.1 SR	581	6.1 Wd	590	6.1 Sh
545	6.1 Hr	556	6.2 Hf	564	6.3 Oy	573	5.9 Mi	581	6.0 Wp	590	6.2 Wp
546	6.3 Hf	556	6.4 Rb	565	6.6 Bc	573	6.2 Gy	581	6.0 Wa	590	6.2 Wa
546	6.6 Kp	556	5.9 Ar	565	6.1 Hf	573	6.2 Hr	581	6.2 Rb	591	6.2 Wa
546	6.4 Cy	556	6.0 Jo	565	6.1 Rc	573	6.1 Ar	581	6.1 Ko	592	6.0 Ra
546	6.1 Si	556	6.2 Wd	565	6.3 Wa	573	6.1 Si	581	6.1 Hf	592	6.2 Pt
547	6.6 Ba	556	6.1 Cy	565	6.2 Wp	573	6.1 Bc	581	6.1 Lu	592	6.5 Wh
547	6.1 Ar	557	6.3 Ba	565	6.1 Wd	573	6.1 Cy	581	6.0 Cy	593	6.2 Wp
547	5.9 Rc	557	6.5 Ah	565	6.0 Jo	573	6.0 Ba	581	6.4 Ah	593	6.2 Wa
547	6.5 Cy	557	6.1 Cy	565	5.9 Pt	573	6.6 Ah	581	6.1 Kg	593	5.8 Rc
547	6.4 Ch	557	6.1 Jo	565	6.3 We	573	6.4 Pt	583	6.3 Pt	594	6.0 Wp
548	6.2 Fs	558	6.3 Ba	565	6.0 Si	573	6.0 Rc	583	5.9 Rc	594	6.0 Jo
548	6.4 Rb	558	6.1 Kg	565	6.3 Rb	574	5.8 Jo	584	6.2 Ar	594	6.1 Fi
548	6.4 Ko	558	6.2 Hf	565	6.1 Ko	574	6.5 Ba	584	6.3 Rb	594	6.2 Wa
548	6.7 Kp	558	6.4 Rb	565	6.2 Lu	574	6.1 Si	584	6.2 Pb	594	6.0 Kg
548	6.3 Lu	558	6.2 Ko	565	6.1 Cy	574	6.2 Rb	584	6.3 Ah	594	6.0 Hf
548	6.4 Cy	558	6.7 Ah	566	6.1 Sx	574	6.1 Lu	585	6.1 Ar	595	6.0 Pt
548	6.0 Jo	558	6.1 Sh	566	6.1 Ra	574	6.0 Ah	585	6.2 Ba	595	5.6 SR
549	6.3 Ba	558	6.2 Wa	566	6.2 Wa	574	6.2 Oy	585	6.2 Rb	596	5.9 Ba
549	6.4 Rb	558	6.0 Cy	566	6.2 Wp	574	6.1 Pt	585	6.3 Kp	596	5.8 Jo
549	6.4 Ko	558	6.2 Jo	566	6.2 Jo	574	6.1 Sx	586	6.1 Gy	596	6.0 Hz
549	6.6 Kp	558	6.9 Je	566	6.1 Si	575	6.1 Sh	586	6.2 Ar	596	6.0 Hf
549	6.8 Ah	559	6.1 Sx	566	6.4 Rb	575	6.3 Ar	587	6.2 Ar	596	6.0 Wa
549	6.0 Wa	559	6.2 Ra	566	6.2 Ko	575	6.0 Wa	587	6.1 Si	596	5.9 Pt
549	6.3 Cy	559	6.0 Wa	566	6.2 Oy	575	6.1 Wd	587	6.0 Be	597	6.0 Jo
549	6.1 Si	559	6.1 Cy	566	6.0 Fs	575	6.0 Si	587	6.2 Gw	597	5.9 Pt
549	6.4 Gy	559	6.0 Jo	567	6.0 Pt	575	6.1 Ko	587	5.9 Pt	597	5.5 SR
550	6.3 Ko	559	6.0 Gy	567	6.1 Si	575	6.1 Hf	587	5.9 Rc	598	5.8 Rc
550	6.3 Ar	559	6.4 Rb	567	6.1 Hq	575	6.1 Cy	588	5.9 Ra	598	5.9 Gy
550	6.6 Kp	559	6.2 Ko	567	6.3 Oy	575	6.1 Pt	588	6.2 Wp	599	6.2 Wa
550	6.3 Wd	560	6.0 Rc	568	5.9 Rc	576	6.8 Hz	588	6.0 Ar	599	6.0 Gy
550	6.2 Jo	560	6.1 Gy	568	5.8 Hu	576	5.9 Ra	588	6.0 Wa	599	5.9 Pt
550	6.1 Si	560	6.0 Pt	568	6.0 Ra	576	6.0 Jo	588	6.1 Kg	599	6.2 Ru
551	6.3 Ko	560	6.1 Si	568	6.2 Ar	576	6.2 Ar	588	6.1 Si	600	6.0 Jo
551	6.0 Wa	560	6.1 Hq	568	6.1 Si	576	6.0 Wa	588	6.3 Rb	601	6.0 Wa
551	6.3 Cy	561	6.2 Hr	568	6.0 Be	576	6.0 Si	588	6.2 Kp	601	5.8 Kg
551	6.2 Hr	561	6.0 Oy	569	6.2 Wa	576	6.2 Rb	588	6.0 Ko	601	5.8 Lr

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R CrB			V CrB			RZ Sco			U Ser			SX Her			SX Her		
154428			154639			*155823*			160210			160325			160325		
601	6.0	Pt	551	10.6	Cy	533	9.1	Ht	537	9.3	Cy	555	8.5	Hf	597	8.4	SR
601	5.6	SR	557	9.4	Jo	539	9.1	Ht	545	8.8	L	555	8.1	Lt	598	8.7	Mc
601	6.0	Rc	558	10.2	Hf	545	9.4	Ht	546	8.8	Hf	557	7.9	Ko	599	8.2	Pt
601	6.2	Ru	561	9.6	Sq	545	8.9	L	548	8.7	Jo	558	7.9	Ko	600	8.7	Mc
602	5.6	SR	563	9.4	Mc	545	8.9	En	551	8.9	Cy	558	8.3	Hf	602	8.0	Pt
602	5.9	Pt	563	9.5	Jo	551	9.3	Ht	557	8.4	Jo	558	8.2	Jo	603	8.2	SR
602	6.0	Kg	565	8.7	Pt	563	9.6	Ht	558	8.6	Hf	559	8.3	Jo	W Sco		
603	6.1	Jo	565	9.8	Cy	565	9.6	Pt	559	8.7	Ra	559	8.2	Lt	*160519*		
603	5.6	SR	566	9.9	Wd	567	9.1	En	560	9.0	Ri	560	8.1	Pt	546	14.7	L
X CrB			566	9.3	Jo	574	9.7	Jo	560	9.0	Cy	561	8.2	Sq	577	14.1	Ar
154536			566	9.9	Sh	589	10.7	Pt	563	8.4	Jo	562	8.0	Pt	RT Sco		
514	9.8	Ch	566	9.9	Hf	600	11.5	Jo	565	8.7	Wd	562	8.5	Ko	*165636*		
537	9.0	Cy	566	10.3	Hi	Z Sco			565	8.1	My	563	8.3	Ko	540	10.5	Bl
543	9.2	L	567	10.1	Md	*160021*			565	8.6	Pt	563	8.5	Sx	556	8.7	Bl
543	9.5	Jo	570	10.0	Hf	534	11.3	Ht	566	8.1	Jo	564	8.2	Mc	RU Her		
545	9.1	Ch	570	9.8	Wa	535	11.7	Ar	570	8.2	Jo	564	8.0	Pt	160625		
550	9.4	Jo	570	9.4	Jo	539	11.2	Ht	570	8.8	Wa	564	8.2	Lt	511	9.0	Ch
551	9.4	Cy	572	9.3	Mc	540	11.1	Bl	570	8.5	Br	565	8.5	Ko	530	10.5	Ko
557	9.5	Jo	574	9.4	Jo	545	10.6	L	570	8.9	Cy	565	8.4	Hf	542	10.5	Ko
560	9.7	Ri	575	9.9	Md	545	10.9	Ht	570	8.6	Hf	565	8.3	Wd	545	10.4	Ch
560	9.6	Cy	575	10.1	Cy	545	10.9	En	574	8.6	Jo	565	8.0	Pt	545	9.9	L
563	9.5	Jo	576	8.4	Sq	547	10.6	Ar	576	8.6	Sx	566	8.5	Sx	546	10.5	Hf
565	9.5	Pt	577	9.0	Jo	556	10.5	Bl	576	7.9	Ra	566	8.4	Jo	548	10.4	Jo
566	9.3	Jo	581	9.8	Hf	561	10.0	Ar	577	8.6	Jo	567	8.0	Pt	551	10.4	Cy
566	9.9	Hi	581	9.8	Wd	563	10.4	Ht	577	8.0	Ar	568	8.3	Lt	553	10.6	Ra
567	10.0	Br	582	9.0	B	563	10.4	Gw	582	8.5	B	569	8.1	Pt	558	10.7	Jo
570	9.4	Jo	587	8.2	Wh	563	10.0	Ar	585	8.6	Hf	570	8.4	Jo	559	11.0	Jo
574	10.9	Jo	588	9.7	Hf	567	10.3	En	589	8.4	My	570	8.2	Hf	559	10.9	Gy
575	9.6	Cy	589	8.6	Pt	568	10.1	Ar	589	8.6	Pt	572	8.4	Mc	561	10.5	Sq
577	11.0	Jo	590	9.6	Cy	568	10.0	Hu	590	8.7	Sh	573	8.1	Ar	562	10.7	Ko
582	10.5	B	596	8.5	Jo	569	10.3	Rc	590	8.8	Cy	573	8.2	Pt	563	11.0	Mc
589	11.5	Pt	R Lib			574	10.3	Jo	593	9.2	Ri	574	8.2	Pt	564	11.1	Mc
590	11.1	Cy	*154715*			589	9.9	Ar	594	8.4	My	574	8.2	Jo	565	10.8	Hf
R Ser			514	[13.5	Ch	597	9.7	Jo	594	8.7	Jo	575	8.6	Sx	565	10.8	Cy
154615			545	[13.5	L	600	9.9	Rc	596	8.8	Jo	575	8.0	Sq	565	10.8	Pt
511	10.1	Ch	589	[13.0	Ar	R Her			596	8.9	Hf	575	8.9	Ko	566	11.0	Sx
537	11.2	Cy	597	10.8	Jo	160118			597	8.5	My	575	8.0	Pt	566	10.7	Jo
545	12.0	L	R Lup			532	13.4	L	600	8.5	Jo	576	8.6	Ko	570	10.7	Jo
545	11.8	Ch	*154736*			555	13.3	L	602	8.7	My	576	8.3	Lt	570	10.8	Hf
551	12.3	Cy	544	13.4	Sl	559	12.5	Ra	X Sco			576	8.9	Ra	570	10.7	Br
565	12.4	Cy	554	13.0	Sl	559	12.7	Gy	*160221a*			577	8.3	Jo	572	11.3	Mc
565	12.5	Pt	567	12.3	En	565	12.6	Pt	540	11.2	Bl	577	8.6	Ko	573	11.1	Gy
569	12.9	Br	RR Lib			565	12.7	Cy	545	11.1	L	577	8.2	Ar	573	10.9	Ar
575	12.9	Cy	*155018*			565	12.0	Wd	556	11.2	Bl	578	8.2	Pt	574	11.4	Jo
577	12.8	Hz	545	13.5	L	567	11.9	Jo	577	13.2	Ar	580	8.2	Pt	575	10.8	Sx
589	[13.2	Pt	565	[11.9	Pt	570	12.1	Jo	SX Her			581	8.6	Wd	575	10.5	Sq
V CrB			590	[13.8	B	576	11.6	Br	160325			581	8.5	Hf	575	11.1	Cy
154639			Z CrB			573	11.5	Gy	530	8.1	Ko	583	8.4	Pt	576	11.1	Ra
514	10.0	Ch	155229			575	11.0	Cy	535	8.0	Ko	585	8.4	Hf	577	11.6	Jo
533	9.2	Pk	514	12.3	Ch	576	11.1	Ra	537	8.0	Lt	587	8.2	Pt	577	11.0	Ko
537	10.4	Cy	543	14.0	L	576	10.9	Jo	542	8.2	Ko	588	8.4	Pt	577	11.4	Ar
540	10.0	Sq	570	12.8	Wa	576	10.3	Ko	542	8.2	Lt	589	8.4	Pt	581	11.2	Wd
543	9.3	L	T CrB			588	9.0	Gy	545	7.8	L	590	8.4	Lt	581	11.0	Hf
543	9.6	Jo	155526			589	8.9	Pt	546	8.1	Hf	590	8.8	Mc	588	11.5	Gy
545	10.4	Ch	565	9.8	Pt	593	8.5	B	548	8.3	Jo	592	8.2	Pt	589	11.2	Pt
546	10.5	Hf	573	9.8	Pt	596	8.4	Hf	548	8.1	Ko	595	8.4	Lt	589	11.4	B
548	9.4	Jo				597	8.5	Sf	553	8.6	Ra	596	8.2	Pt	590	11.0	Cy
						600	8.0	Jo	555	8.3	Sh	596	8.6	Hf			

Variable Star Observations Received During May and June, 1934.

J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs.

R Sco
161122a
505 13.2 Bm
513 13.8 Bm
522 14.5 Bm
546 14.4 L
555 13.6 Bm
568 14.0 Ar
571 13.5 Ar
600[12.4 Jo
S Sco
161122b
513 14.0 Bm
522 14.0 Bm
529 12.5 Bm
534 12.6 Ht
539 12.4 Ht
540 13.0 Bl
543 13.2 Bm
545 12.8 L
545 12.5 Ht
545 12.8 En
555 12.1 Bm
563 11.7 Ht
567 11.6 Pt
567 12.0 En
568 11.6 Hu
568 11.5 Ar
571 11.4 Ar
574 10.5 Jo
577 10.6 Jo
579 10.6 Jo
590 11.5 Wa
590 11.4 Wp
600 10.4 Jo
601 12.1 Wa
W CrB
161138
543 11.2 L
546 11.2 Hf
553 11.5 Ra
565 11.8 Wd
567 12.0 Pt
572 11.8 Ar
573 11.8 Ar
576 12.4 Ra
577 12.4 Ar
570 11.8 Br
W Oph
161607
514 12.5 Ch
545 12.8 L
592[12.5 Pt
V Oph
162112
514 7.2 Ch
546 7.7 L
546 8.1 Hf
556 8.1 Hf
563 7.7 Jo

V Oph
162112
566 7.6 Jo
566 7.9 Kn
567 8.0 Pt
570 8.1 Hf
574 7.9 Jo
577 7.7 Jo
582 7.9 Gg
588 8.1 Sz
591 8.5 Hf
592 8.0 Pt
U Her
162119
511 7.8 Ch
534 7.8 Pk
535 8.3 Kp
535 7.7 Ar
536 7.8 Se
536 8.2 Kp
536 8.1 Ah
537 8.2 Kp
538 8.1 Kp
540 8.0 Kp
541 8.3 Kp
543 8.2 Kp
543 8.1 Ah
544 7.5 Ar
545 8.3 Ch
546 8.2 Hf
546 8.1 L
546 8.2 Kp
547 7.7 Ar
548 8.3 Kp
548 8.0 Jo
549 8.3 Kp
549 8.2 Ah
550 7.7 Ar
550 8.2 Kp
551 8.6 Cy
552 8.2 Oy
552 8.2 Ah
555 8.2 Kp
555 8.3 Sh
555 8.2 Hf
557 8.4 Ah
557 8.0 Jo
559 8.8 Wd
559 8.9 Ra
559 8.7 Gv
561 8.6 Pk
561 8.0 Ar
561 8.8 Oy
562 8.4 Hh
563 8.1 Ar
563 8.8 SR
563 9.0 Gw
563 8.3 Jo
563 8.8 Mc
564 8.8 Mc

U Her
162119
564 8.8 Ah
564 8.9 Oy
565 8.7 Cy
566 8.8 Sx
566 8.2 Jo
566 9.2 Lu
567 8.7 Pt
568 8.3 Pk
568 8.3 Ar
569 8.6 Ar
569 8.7 Ah
570 8.2 Wa
570 9.1 Sf
570 8.6 Jo
570 8.9 Hf
570 8.9 Br
571 8.5 Mc
573 9.2 Gy
573 8.4 Ar
573 9.0 Ah
574 9.1 Oy
575 9.1 Cy
575 9.2 Sx
575 8.7 Sh
576 8.9 Ra
578 8.6 Hh
580 8.6 Ar
581 9.3 Ah
582 9.1 B
584 9.2 Ah
585 8.7 Ar
585 9.1 Gw
585 9.7 Lf
586 9.3 Gy
587 9.0 Hu
587 9.1 Gw
587 9.0 Ar
588 9.3 Gw
588 9.2 Hf
588 9.2 Kp
588 9.3 Ah
589 9.5 Kp
589 9.4 Gw
590 9.4 Cy
590 9.4 Sh
592 9.8 Pt
593 9.6 Sf
598 9.5 Mc
600 9.5 Mc
Y Sco
162310
546 13.2 L
g Her
162542
537 5.4 Lt
542 5.1 Lt
555 4.9 Lt
564 5.1 Lt

g Her
162542
570 5.2 Lt
576 5.2 Lt
579 5.0 Lt
590 5.2 Lt
595 5.1 Lt
SS Her
162807
514 12.8 Ch
546 11.6 L
550 11.7 Jo
551 11.4 Cv
557 10.4 L
559 11.2 Jo
563 10.3 Jo
565 10.3 Cy
565 10.0 Hf
566 9.9 Jo
567 9.9 Pt
570 9.8 Hf
570 9.9 Br
570 9.7 Jo
575 9.7 Cy
582 9.5 B
588 9.4 Hf
590 9.7 Cy
592 10.0 Pt
593 9.6 Sf
600 10.4 Sf
T Oph
162815
518 11.2 Ch
540 10.5 Bl
546 10.4 L
556 10.6 Bl
565 10.8 Jo
567 11.1 Pt
S Oph
162816
518 9.6 Ch
540 10.0 Bl
546 10.5 L
556 10.6 Bl
W Her
163137
514 12.1 Ch
535 12.8 Ar
536 12.8 Ar
545 12.8 Fd
547 13.4 Ar
555 12.9 L
561 13.9 Ar
563 13.2 Ar
563 13.1 Gw
564 13.0 Kn
565 13.3 Kn
567 12.3 Pt
568 13.0 Ar
569 13.3 Ar

W Her
163137
570 13.3 Kn
570 13.0 Wa
570 12.8 Br
571 12.8 Ar
573 12.6 Ar
576 12.8 Ar
577 12.5 Ar
580 12.8 Ar
585 12.6 Ar
585 12.6 Gw
586 12.3 Ar
587 12.1 Ar
587 12.0 Gw
587 12.0 Hu
588 11.9 Gw
589 12.0 Gw
589 12.0 Kn
590 11.8 B
592 11.8 Pt
600 11.3 Kn
R UMi
163172
538 9.4 Hf
538 9.2 Sq
538 9.4 Sh
542 9.4 Hf
542 9.5 Wd
543 9.3 Jo
544 9.4 Ra
550 9.1 Jo
556 9.5 Hf
556 9.4 Wd
557 9.0 Jo
559 8.9 Jo
562 9.3 Sq
565 8.8 Jo
566 9.4 Wd
566 9.4 Hf
566 9.4 Sh
569 9.5 Ra
570 8.8 Jo
570 9.5 Hf
577 9.4 Sq
585 9.5 Hf
596 9.6 Hf
R Dra
163266
514 7.9 Ch
530 7.5 Se
532 7.8 Ch
534 7.5 Pk
536 7.6 Se
536 7.7 Ah
538 7.7 Hf
538 7.8 Sh
542 7.4 Wd
543 7.5 Ah
543 7.5 Jo

R Dra
163266
545 7.4 Ch
546 7.1 Si
549 7.6 Ah
550 7.5 Wd
550 7.1 Jo
552 7.5 Ah
553 7.5 Ah
555 7.8 Wd
556 7.5 Wd
556 7.8 Fs
556 7.4 Hf
557 7.6 Lu
557 7.2 Jo
558 7.6 Ah
558 7.6 Wd
558 7.6 Sh
559 7.0 Jo
561 7.4 Pk
563 7.3 Sx
564 7.7 Ah
565 7.4 Wd
565 7.3 Jo
566 7.4 Wd
566 7.7 Sh
566 7.6 Hf
566 7.3 Sx
566 7.6 Ra
567 7.7 Pt
569 7.6 Ah
570 7.2 Jo
570 7.8 Hf
573 7.7 Ah
574 7.7 Ah
574 7.9 Ra
576 7.6 Sx
581 7.8 Ah
584 7.9 Ah
585 7.9 Hf
588 7.9 Ah
589 8.1 Lu
592 7.8 Pt
596 8.6 Hf
RR Oph
164319
505 13.8 Bm
513 14.4 Bm
522 14.4 Bm
543 14.7 Bm
567[12.0 En
592[12.8 Pt
S Her
164715
514 10.3 Ch
536 10.1 Ah
546 11.3 L
551 12.0 Cy
557 12.2 L
559 12.2 Jo

Variable Star Observations Received During May and June, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
S Her		**R Oph**		**RS Her**		**T Dra**		**T Her**		**W Lyr**	
164715		*170215*		171723		*175458a*		180531		181136	
561	12.2 My	563	9.5 Jo	514	11.5 Ch	518	9.5 Ch	599	12.8 Gy	571	8.3 Pt
565	12.3 My	563	11.0 Ar	548	8.5 Jo	565	8.7 Jo	**W Dra**		572	8.3 Je
565	13.0 Cy	565	10.2 Hf	551	9.1 Cy	565	10.2 Cy	180565		573	8.3 Ah
567	12.3 Pt	566	11.0 Ra	557	8.5 Jo	566	10.0 GC	520	13.0 Ch	574	8.3 Ah
570	12.5 Jo	568	10.8 Hu	563	8.5 Jo	576	9.4 Jo	537	13.6 Pf	574	8.3 Jo
571	12.0 Ar	568	10.0 Ar	563	8.6 SR	578	9.7 Cy	575	14.3 Pf	574	8.2 Wx
573	12.2 Ar	570	10.4 Hf	565	8.7 Cy	588	9.9 Cy	592[	12.9 Pt	574	8.4 Pk
577	12.3 Ar	570	10.6 Rc	566	8.3 Jo	588	9.8 Sz	**X Dra**		576	8.3 Ra
593	13.1 B	573	10.3 Gy	567	8.3 Pt	591	10.4 GC	180666		577	8.3 Jo
594	12.8 My	576	10.4 Ra	570	8.2 Jo	**UY Dra**		520	11.3 Ch	581	8.7 Wd
597	12.6 My	577	9.4 Ar	575	8.1 Cy	*175458b*		537	14.2 Pf	581	8.7 Hf
602	12.7 My	582	10.0 Gg	579	8.1 Br	482	10.0 Cy	575	14.2 Pf	581	8.5 Cy
RS Sco		588	8.5 Gy	590	7.6 B	518	12.0 Ch	**TV Her**		581	8.7 Ah
164844		589	8.6 Ar	590	7.8 Cy	565	12.5 Jo	181031		583	8.9 Je
534	10.8 Ht	590	8.8 Sx	592	7.5 Pt	565	10.8 Cy	544	11.7 L	584	8.8 Ah
535	10.6 Bl	591	8.7 Hf	600	8.0 Sf	566	12.0 GC	557	10.3 L	588	9.1 Ah
539	11.0 Ht	592	8.1 Pt	**S Oct**		576	11.7 Jo	**RY Oph**		588	8.9 Pk
545	11.3 Ht	598	8.6 Mc	*172486*		578	10.6 Cy	181103		588	9.0 Wx
547	11.1 En	599	8.1 Gy	515	8.8 En	588	10.3 Cy	563	10.5 Ra	589	9.4 Je
556	10.9 Bl	600	8.8 Mc	533	8.6 Ht	588	11.3 Sz	566	10.0 Kn	590	9.2 Sx
563	11.7 Ht	601	7.9 Ru	535	8.4 Bl	591	12.0 GC	566	9.9 Cy	590	9.3 Sh
567	11.3 En	602	7.8 Ru	539	8.8 Ht	**RY Her**		569	9.3 Cy	590	9.1 Hf
RR Sco		603	7.8 Ru	542	9.1 En	175519		571	8.4 Pt	592	9.6 Pt
165030a		607	7.8 Ru	545	9.1 Ht	520	10.0 Ch	576	9.0 Ra	593	9.4 Sf
534	6.1 Ht	**RT Her**		551	9.3 Ht	567	13.3 Pt	576	9.3 Cy	594	9.0 Jo
539	5.8 Ht	170627		556	9.6 Bl	590	13.9 B	581	8.5 Hf	600	9.9 Jo
540	5.7 Bl	514	9.4 Ch	563	10.0 Ht	**V Dra**		590	8.3 Lt	600	9.8 Sf
545	5.4 Ht	537	11.0 Pf	567	9.7 En	175654		591	8.5 Hf	603	10.3 Jo
551	5.4 Ht	542	11.5 Ko	577	10.3 En	520	12.2 Ch	592	8.2 Pt	**RV Sgr**	
554	5.0 Sl	563	12.9 SR	**RU Oph**		572	13.8 Br	600	8.7 Mc	*182133*	
556	5.5 Bl	567	13.2 Pt	172809		592[	12.7 Pt	**W Lyr**		540	13.1 Bl
563	4.9 Ht	568	12.9 Ar	518	9.6 Ch	**R Pav**		181136		568[	13.6 En
567	5.0 En	569	12.9 Ar	567	12.6 Pt	*180363*		536	8.3 Ah	**SV Her**	
SS Oph		573	13.0 Ar	570	13.1 Wa	534	8.0 Ht	543	7.9 Ah	182224	
165202		575	13.3 Pf	592[	12.6 Pt	539	8.0 Ht	546	7.8 L	520	11.0 Ch
514[	12.6 Ch	577	13.2 Br	**RU Sco**		545	8.1 Ht	546	7.7 Hf	546	13.2 L
551	10.7 Cy	590	13.2 B	*173543*		563	8.5 Ht	549	8.0 Ah	577	14.4 Wa
565	9.1 Cy	590	12.8 Ra	540	13.5 Bl	568	8.7 En	552	7.7 Ah	592[	12.5 Pt
567	8.7 Pt	**RW Sco**		568[	13.1 En	**T Her**		553	7.8 Ah	**T Ser**	
570	9.2 Jo	*170833*		**SV Sco**		180531		553	7.6 Hf	182306	
575	8.9 Cy	540	13.0 Bl	*174135*		520	7.9 Ch	557	7.8 Ah	520	9.6 Ch
590	8.9 Cy	568	12.5 En	540	10.3 Bl	536	9.4 Ah	557	7.5 L	563	10.8 Jo
592	8.3 Pt	**Z Oph**		556	10.6 Bl	543	9.8 Ah	557	7.8 Jo	570	11.0 Jo
RV Her		171401		568	11.4 En	546	10.7 Hf	558	7.7 Ah	571	11.1 Pt
165631		546	9.7 Hf	**W Pav**		546	10.1 L	559	7.7 Jo	576	11.0 Jo
514	12.0 Ch	551	10.0 Cy	*174162*		549	10.4 Ah	561	7.5 Wx	577	11.7 Wa
570	14.2 Br	556	9.3 Hf	537[	13.0 Bl	557	12.0 L	561	7.7 Pk	592	11.7 Pt
571	13.8 Ar	563	8.6 Jo	545[	13.0 Ht	559	12.1 Ra	563	7.6 Ra	594	11.4 Jo
573	13.9 Ar	565	8.2 Cy	568[	13.0 En	560	12.3 Gy	563	8.0 Jo	596	11.6 Jo
576	13.6 Ar	566	8.7 Jo	**U Ara**		567	12.6 Pt	563	7.5 SR	600	12.1 Jo
580	14.2 Ar	567	8.4 Pt	*174551*		571	13.2 Ar	564	7.9 Ah	**SV Dra**	
589	13.6 Ar	569	9.0 Ra	534[	13.0 Ht	573	13.4 Ar	565	7.8 Hf	183149	
R Oph		570	9.1 Hf	545[	13.0 Ht	576	12.6 Ra	565	8.2 Wd	579	11.3 Br
170215		570	8.6 Jo	568[	13.0 En	578	13.1 Cy	566	7.7 Jo	**RZ Her**	
518	13.0 Ch	575	8.1 Cy	**RT Oph**		579	13.5 Br	566	7.8 Je	183225	
535	11.8 Ar	590	8.2 Cy	175111		591	13.6 Wp	569	8.2 Cy	520	12.0 Ch
547	11.3 Ar	591	8.2 Hf	518[	13.7 Ch	591	13.4 Wa	569	8.0 Ah	546	14.1 L
555	11.5 L	592	8.0 Pt	592[	12.5 Pt	592	13.1 Pt	570	8.1 Hf		

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.	J.D.Est.	Obs.
X OPH		R SCT		R SCT		NOV AQL		T CRA		RX SGR	
183308		*184205*		*184205*		184300		*185537b*		*190818*	
520	7.4 Ch	565	5.4 Cy	589	6.0 Pt	576	10.7 Ar	563	12.4 Ht	596	[12.4 Pt
545	8.0 Cy	566	5.8 Jo	589	5.6 Ar	577	10.9 Ar	Z LYR		RW SGR	
553	8.3 Cy	566	5.3 Cy	589	6.2 Ra	577	11.1 Jo	185634		*190819a*	
557	8.3 Jo	568	5.6 Hu	589	5.6 Di	580	10.8 Ar	520	[14.0 Ch	517	11.1 Ch
563	8.4 Ra	568	5.6 Ar	590	5.4 Mc	581	11.2 Cy	533	[14.5 L	541	10.7 Ht
563	8.4 Jo	569	5.6 Jo	591	6.0 Kg	584	10.7 Pb	592	[12.3 Pt	555	9.8 L
564	8.4 Oy	569	5.7 Ar	591	5.9 Hf	584	10.7 Ar	SU SGR		563	9.8 Ht
566	8.5 Jo	569	5.4 Cy	592	6.0 Pt	585	10.6 Ar	*185722*		571	9.2 Pt
569	8.4 Cy	570	5.5 Jo	594	5.9 Kg	585	10.4 Gw	541	8.4 Ht	578	9.6 Cy
570	8.2 Rc	570	5.7 Ko	594	6.0 Hf	586	10.6 Ar	563	8.7 Ht	592	9.6 Cy
570	8.5 Jo	570	6.0 Hf	594	5.5 Jo	587	10.5 Ar	RT LYR		596	9.0 Pt
571	8.0 Pt	570	5.4 Cy	595	5.6 SR	587	10.6 Hu	185737		603	9.4 Jo
574	8.6 Jo	570	6.1 Rc	595	5.8 Rc	587	10.4 Gw	520	10.3 Ch	TY AQL	
575	8.3 Ko	571	5.8 Ar	596	5.9 Pt	588	10.5 Ar	533	12.0 L	*190907*	
576	8.4 Ra	573	6.0 Gy	596	5.5 Ba	589	10.6 Ar	556	12.9 L	570	10.9 Jo
577	8.6 Jo	573	5.8 Hr	596	5.9 Kg	589	10.6 Di	R AQL		570	10.5 Cy
581	8.9 Cy	573	5.9 Cy	596	5.4 Jo	590	11.0 Ra	190108		571	10.3 Pt
592	8.6 Pt	573	5.8 Ar	596	5.9 Hf	596	11.2 Jo	516	6.4 Ch	577	10.5 Ar
594	8.5 Jo	573	5.9 Pt	597	5.6 SR	596	11.6 Pt	535	5.9 Ah	580	10.3 Ar
595	8.8 Rc	574	5.8 Jo	597	5.5 Jo	599	10.5 Gy	536	6.0 Ah	584	10.6 Ar
596	8.6 Jo	575	6.5 We	598	5.6 Gy	600	11.4 Jo	537	5.9 Se	585	10.5 Ar
603	8.6 Jo	575	5.8 Ko	598	5.6 Mc	S SCT		542	6.2 Ko	586	10.5 Ar
RY LYR		575	6.0 Cy	599	5.8 Gy	*184408*		543	6.1 Ah	587	10.3 Ar
184134		575	5.8 Ar	599	5.9 Pt	566	7.6 Lt	545	6.0 Ah	587	10.4 Hu
520	[13.2 Ch	576	5.9 Ar	600	5.5 Mc	579	7.3 Lt	549	6.3 Ah	589	10.4 Ar
546	14.4 L	576	6.0 Pt	600	5.6 Jo	RX LYR		552	6.1 Ah	596	10.4 Pt
577	[14.1 Wa	576	6.1 Cy	601	6.0 Pt	185032		555	6.1 Ch	S LYR	
592	[12.4 Pt	576	6.1 Ra	601	5.7 SR	520	13.2 Ch	557	6.2 Ah	190925	
R SCT		576	5.4 Jo	602	5.6 Hz	535	14.2 Ar	564	6.5 Ah	520	[13.5 Ch
184205		577	5.4 Jo	602	5.8 Kg	555	[14.1 L	565	7.0 Hf	533	14.4 L
517	5.9 Ch	577	6.0 Bo	602	5.9 Pt	561	[13.4 Ar	566	7.0 Jo	573	[12.3 Gy
521	6.0 Ch	577	6.1 Cy	603	5.3 Jo	563	[12.5 Gw	569	6.6 Ah	588	12.2 Gy
530	6.2 Kp	577	5.8 Ar	603	5.6 SR	571	[13.0 Pt	570	7.1 Jo	596	11.9 Pt
535	6.4 Ar	578	6.0 Pt	RW LYR		575	[12.5 Ar	570	7.1 Hf	X LYR	
536	6.9 Cy	578	6.0 Cy	184243		580	[13.9 Ar	570	6.9 Cy	190926	
542	6.5 Ko	579	6.1 Cy	555	[14.2 L	587	[13.0 Hu	571	7.0 Pt	571	8.8 Pt
544	6.3 Pt	580	5.7 Ar	NOV AQL		592	[13.0 Pt	573	6.9 Ah	596	9.0 Pt
545	6.6 Cy	580	5.8 Pt	184300		S CRA		574	7.5 Jo	RS LYR	
547	6.8 Cy	581	6.0 Kg	520	10.9 Ch	*185437a*		575	6.8 Ko	190933a	
547	6.3 Ar	581	6.0 Hf	535	10.7 Ar	540	12.0 Bl	577	7.4 Jo	556	12.6 L
548	6.1 Kp	581	5.8 Cy	544	11.6 Pt	541	11.9 Ht	581	7.6 Hf	571	12.3 Pt
551	6.2 Cy	581	6.0 Wd	547	10.8 Ar	554	12.5 Sl	581	7.5 Cy	573	11.9 Gy
552	6.0 Cy	582	6.6 Gg	554	10.5 Ar	563	11.8 Ht	581	7.4 Ah	576	12.0 Gy
552	5.8 Ch	583	5.9 Pt	555	10.8 Ar	568	12.0 En	584	7.6 Ah	588	11.9 Gy
553	5.9 Cy	584	5.8 Ar	561	10.8 Ar	ST SGR		588	7.9 Ah	596	12.0 Pt
554	6.0 Sl	584	5.8 Pb	563	10.8 Ar	*185512a*		592	7.0 Pt	599	12.1 Gy
554	5.8 Ar	585	5.6 Lf	563	11.1 Ra	520	[12.5 Ch	594	8.2 Jo	RU LYR	
555	5.8 Ar	585	5.7 Ar	566	11.3 Jo	R CRA		600	8.3 Jo	190941	
555	6.3 Ra	585	5.8 Gw	568	11.0 Hu	*185537a*		V LYR		520	11.8 Ch
555	6.2 L	586	5.6 Ar	568	10.9 Ar	540	12.1 Bl	*190529a*		556	12.8 L
556	5.9 Hf	587	5.7 Ar	569	11.1 Ar	541	12.1 Ht	520	[13.3 Ch	596	[13.3 Pt
561	5.9 Ar	587	5.7 Hu	570	11.7 Cy	554	11.7 Sl	533	[14.1 L	U DRA	
563	5.8 Ar	587	5.7 Hk	570	11.3 Jo	563	11.6 Ht	571	[12.3 Pt	190967	
563	5.8 Ra	587	5.8 Gw	571	10.9 Ar	568	11.1 En	596	[13.3 Pt	520	9.8 Ch
563	6.0 Cy	588	5.7 Gy	573	10.8 Ar	T CRA		RX SGR		537	9.7 Pf
563	5.7 Jo	588	5.6 Gy	573	11.5 Pt	*185537b*		*190818*		548	9.3 Jo
564	5.7 Ko	588	5.6 Ar	574	11.3 Jo	540	13.0 Bl	517	[11.1 Ch	557	9.4 Jo
565	5.9 Hf	588	5.8 Pt	575	10.8 Ar	554	[12.5 Sl	541	[12.7 Ht	559	9.4 Jo

Variable Star Observations Received During May and June, 1934.

J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs.

U Dra
190967
563 10.1 Ra
566 9.6 Jo
570 9.7 Jo
571 9.7 Pt
575 11.6 Pf
576 10.0 Jo
578 11.3 Ra
592 11.7 Wp
594 11.0 Jo
596 10.9 Pt

W Aql
191007
520 12.5 Ch
544 13.2 L

T Sgr
191017
517 7.8 Ch
555 7.7 L
568 8.5 Hu
568 8.5 Ar
571 8.5 Pt
596 8.9 Pt

R Sgr
191019
517 7.5 Ch
541 8.1 Ht
552 8.0 Ch
555 7.9 L
556 8.4 Hf
563 8.3 Ht
565 8.5 Hf
568 8.8 Hu
568 8.8 Ar
571 9.0 Pt
575 9.4 Ko
581 9.1 Hf
594 10.2 Hf
596 9.9 Pt

RY Sgr
191033
516 9.8 Ch
537 9.0 Dk
540 9.4 Bl
541 9.5 Ht
544 9.4 L
544 8.8 Dk
552 8.3 Ch
554 8.7 Sl
556 8.5 Bl
563 8.9 Ht
563 9.0 SR
573 9.0 Pt
578 9.0 Pt
580 9.0 Pt
583 9.0 Pt
596 9.0 Pt
596 8.8 Jo
600 8.8 Jo

RY Sgr
191033
601 8.5 Pt
602 8.5 Pt
603 8.8 Jo

TY Sgr
191124
540[12.4 Bl

S Sgr
191319a
517 11.8 Ch
532 10.2 Ch
540 11.3 Bl
541 11.0 Ht
544 10.7 L
548 10.8 Ko
555 10.2 L
563 10.4 Ht
568 10.9 Hu
568 10.9 Ar
571 10.5 Pt
575 10.9 Ko
590 11.5 Ra
596 11.9 Pt

Z Sgr
191321
555 10.3 L

SW Sgr
191331
540[12.9 Bl

TZ Cyg
191350
521 10.9 Ch
559 10.7 Jo
563 10.7 Jo
566 10.7 Jo
570 10.8 Jo
571 10.8 Pt
576 10.4 Jo
590 11.2 Ra
596 10.0 Pt
596 10.7 Jo
600 10.6 Jo
603 10.6 Jo

U Lyr
191637
556 10.1 L
559 10.5 Jo
563 11.0 Ra
566 10.7 Jo
569 11.0 Cy
570 11.0 Jo
571 10.5 Pt
576 10.7 Jo
587 11.1 Ra
592 11.2 Cy
594 11.5 Fd
594 11.0 Jo

U Lyr
191637
596 10.8 Pt
603 11.3 Jo

AF Cyg
192745
536 7.0 Ah
537 6.9 Se
543 6.6 Ah
549 6.6 Ah
552 6.9 Ah
553 6.7 Ah
554 7.2 Ra
557 6.6 Ah
558 6.5 Ah
563 7.0 Ra
564 6.5 Ah
569 6.7 Ah
569 7.0 Ra
573 6.7 Ah
581 6.6 Ah
588 6.8 Ah

TY Cyg
192928
517 10.2 Ch
556 11.3 L
571 12.0 Pt
596 12.5 Pt

RT Aql
193311
517 8.8 Ch
556 9.4 L
569 9.6 Be
570 10.3 Cy
570 9.8 Jo
571 9.8 Pt
592 10.8 Cy
596 10.8 Pt

R Cyg
193449
516 8.8 Ch
521 9.0 Ch
536 9.4 Ah
543 9.7 Ah
548 9.7 Jo
556 9.9 Hf
559 10.4 Jo
560 10.1 Gy
562 10.4 Mc
563 9.9 Ra
563 10.6 Jo
564 10.1 Mc
565 10.0 Hf
566 10.8 Jo
568 10.3 Hu
568 10.2 Pk
568 10.4 Ar
569 10.5 Ar
570 11.0 Jo
571 10.4 Mc

R Cyg
193449
571 10.1 Pt
571 10.0 We
573 10.9 Gy
574 11.6 Jo
577 10.9 Wp
577 11.8 Jo
577 10.7 Wa
577 10.7 Ar
578 10.2 Ra
581 10.9 Wp
581 10.9 Wa
581 10.9 Fi
581 10.4 Hf
586 11.0 Gv
590 10.4 Ra
590 11.2 Mc
591 11.1 Wp
591 11.0 Wa
592 11.0 Wp
594 11.1 Hf
594 11.4 Fd
596 12.2 Jo
599 11.4 Pt
601 11.5 SR

RV Aql
193509
556 9.2 L
568 9.5 Hu
569 9.9 Be
571 10.6 Pt
599 12.3 Pt

TT Cyg
193732
538 8.1 Lt
543 8.2 Lt
564 8.2 Lt
571 8.3 Lt
576 8.2 Lt
595 8.1 Lt

T Pav
193972
534 12.0 Ht
535 11.9 Bl
539 12.0 Ht
545 12.2 Ht
563 12.8 Ht

RT Cyg
194048
516 8.3 Ch
521 8.6 Ch
536 9.9 Ah
543 10.6 Ah
559 11.8 Jo
560 11.2 Gy
562 9.6 Mc
563 12.0 Jo
564 9.8 Mc
569 12.0 Ra

RT Cyg
194048
570 11.8 Jo
571 10.2 Mc
571 11.1 Pt
573 11.8 Gy
574 12.5 Jo
577 11.8 Wp
577 11.8 Wa
588 11.4 Gy
591 10.8 Wa
591 11.0 Wp
592 10.9 Wp
594 10.6 Wa
594 10.7 Fi
594 10.0 Fd
594 10.8 Wp
596 11.5 Jo
599 10.8 Pt
600 10.8 Jo
601 10.5 SR

TU Cyg
194348
570 13.0 Ry
571 12.5 Pt
575 12.7 Ry
582 12.3 Ry
587 12.0 Ry
594 11.4 Wa
594 11.0 Hf
594 11.4 Fd
599 11.1 Pt

X Aql
194604
556 11.8 L
568 11.5 Ar
568 11.2 Hu
570 10.6 Jo
571 11.3 Pt
576 11.7 Jo
577 11.4 Ar
580 11.0 Ar
590 11.0 Ra
594 10.4 Hf
598 11.1 Mc
599 10.0 Pt
600 10.9 Mc
600 9.9 Sf
600 9.7 Jo

χ Cyg
194632
549 9.9 Wd
552 10.6 Cy
557 9.8 L
560 10.3 Gy
571 10.8 Pt
573 11.0 Gy
573 10.7 Cy
576 11.2 Gy
581 11.4 Wd
581 11.4 Hf
582 11.0 Gg
587 11.8 Ra
588 11.6 Gy
590 11.2 Cy
594 11.8 Wp
594 11.7 Wa
594 11.6 Fi
598 12.2 Gy
599 12.1 Gy
599 11.9 Pt
601 12.1 Wa

RR Sgr
194029
540 11.2 Bl

RU Sgr
195142
540 8.6 Bl
541 8.5 Ht
556 9.7 Bl
563 10.7 Ht

RR Aql
195202
556 9.4 L
569 9.8 Be
570 10.2 Jo
570 10.1 Cy
576 10.5 Jo
592 10.4 Cy
600 10.8 Jo

RS Aql
195308
544 14.3 L

Nov Cyg
195553
521 13.4 Ch
566[12.0 Jo
573[12.2 Pt
599[12.2 Pt

RR Tel
195656
541[12.6 Ht
563[12.8 Ht

Z Cyg
195849
521 13.0 Ch
563 12.6 Ra
571 12.9 Pt
578 12.6 Ra

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
Z CYG	Z AQL	R DEL	U CYG	S DEL	U DEL
195849	*200906*	201008	201647	203816	204017
599 12.5 Pt	513 13.6 Bm	543 9.8 Ah	564 10.3 Mc	569 10.1 Be	576 7.0 Lt
S TEL	522 13.0 Bm	563 9.7 L	565 9.7 Hf	570 10.6 Jo	595 6.9 Lt
195855	529 12.8 Bm	563 10.1 Jo	569 9.9 Cy	571 10.1 Pt	V AQR
540 13.1 Bl	543 11.8 Bm	565 10.7 Hf	571 8.0 Pt	573 10.5 Cy	204102
541 12.9 Ht	555 10.1 Bm	569 10.8 Ra	571 10.3 Mc	576 10.7 Jo	543 8.6 Lt
563 12.8 Ht	556 9.9 L	569 10.2 Be	574 8.8 Jo	588 9.7 Sz	545 8.5 L
SY AQL	569 10.4 Be	571 10.8 Pt	577 9.0 Jo	591 10.0 Wp	571 8.9 Pt
200212	571 10.7 Pt	575 11.1 Ko	579 8.7 Cy	591 9.8 Wa	602 8.1 Pt
544 14.8 L	601 12.2 Pt	594 11.3 My	581 9.4 Wd	596 9.5 Jo	W AQR
571[12.5 Pt	R SGE	597 11.5 My	581 9.4 Hf	600 9.0 Jo	*204104*
599[12.5 Pt	200916	601 11.8 Pt	587 9.2 Ra	601 9.5 Pt	513 13.2 Bm
S CYG	563 9.0 Jo	602 11.5 My	588 8.9 Cy	V CYG	522 13.0 Bm
200357	596 9.0 Jo	RT CAP	588 9.8 Kp	203847	529 13.5 Bm
521[13.3 Ch	600 8.8 Jo	*201121*	590 9.5 Mc	518 9.8 Ch	555 12.4 Bm
559[11.7 Gy	603 8.9 Jo	601 6.8 Pt	594 8.8 Jo	549 9.9 Wd	556 12.0 L
571[12.4 Pt	RS CYG	SX CYG	594 9.4 Kg	552 9.5 Ch	U CAP
599 12.5 Pt	200938	201130	594 9.5 Hf	554 10.2 Ar	*204215*
R CAP	517 7.2 Ch	521[13.1 Ch	596 9.2 Kg	556 9.5 Hf	557[12.2 L
200514	521 7.2 Ch	571[12.7 Pt	596 8.5 Jo	561 10.1 Ar	T AQR
571 12.8 Pt	536 8.2 Cv	601 11.6 Pt	598 9.5 Mc	563 10.3 Ar	*204405*
599 12.6 Pt	545 7.7 Cy	603 9.6 Jo	600 8.5 Jo	563 9.6 Ra	555 10.8 L
S AQL	546 8.0 Si	RT SGR	601 8.0 Pt	565 10.0 Hf	565 9.7 Hf
200715a	549 7.4 Wd	*201139*	601 9.5 Ru	566 9.6 Jo	571 9.4 Pt
556 10.3 L	552 7.2 Ch	540 12.0 Bl	603 9.5 Ru	567 9.8 Ra	581 8.8 Hf
563 9.6 Jo	553 7.9 Cv	WX CYG	603 8.4 Jo	570 9.7 Jo	594 7.9 Hf
569 10.1 Be	556 7.7 Hf	201437b	603 8.4 Hz	571 9.5 Pt	600 7.7 Jo
570 9.6 Cy	557 7.2 L	521 12.6 Ch	607 9.5 Ru	574 10.0 Jo	602 8.0 Pt
571 9.6 Pt	558 7.8 Cv	536 12.8 Cy	U MIC	577 9.9 Jo	603 7.8 Jo
592 9.6 Cv	559 7.2 Jo	545 12.6 Cy	*202240*	577 10.4 Ar	RZ CYG
596 9.4 Jo	563 7.1 Jo	549 13.1 Wd	540 10.0 Bl	581 10.3 Hf	204846
600 9.4 Jo	563 7.2 Ra	557 13.0 L	RU CAP	587 9.8 Hu	542 13.0 Wa
601 9.5 Pt	565 7.3 Cv	563 12.5 Jo	*202622*	587 9.6 Ar	542 12.9 Wp
603 9.3 Jo	565 7.9 Hf	563 12.4 Ra	505 13.3 Bm	588 10.4 Ra	568 13.3 Ar
RW AQL	569 7.3 Cy	569 12.8 Cy	513 13.0 Bm	594 10.3 Hf	570 12.3 Wa
200715b	570 7.2 Jo	579 12.8 Cy	522 13.4 Bm	596 10.0 Jo	570 12.3 Wp
563 9.4 Jo	571 7.2 Pt	596 12.5 Jo	529 13.4 Bm	600 10.6 Jo	571 12.2 Pt
570 9.5 Cy	573 7.5 Cv	600 12.4 Jo	543 14.0 Bm	601 10.5 Pt	577 12.2 Wp
571 9.4 Pt	574 7.2 Jo	601 13.3 SR	555 14.1 Bm	Y AQR	577 12.2 Wa
592 9.1 Cv	577 7.4 Cv	603 13.3 SR	Z DEL	*203905*	581 12.2 Wa
596 9.4 Jo	577 7.2 Jo	V SGE	202817	505 11.8 Bm	581 11.7 Fi
600 9.3 Jo	579 7.8 Cy	201520	544 14.1 L	513 12.0 Bm	581 12.0 Wp
601 9.3 Pt	579 8.2 Kg	563 11.5 SR	601[12.9 Pt	522 12.0 Bm	591 12.2 Wp
603 9.0 Jo	581 7.8 Hf	595 11.1 SR	ST CYG	529 12.2 Bm	591 12.1 Wa
R TEL	587 7.4 Ra	597 11.9 SR	202954	543 12.6 Bm	592 12.1 Wp
200747	588 7.7 Cy	601 11.6 SR	521 11.0 Ch	545 12.3 L	600 11.0 Jo
540 11.9 Bl	591 8.3 Lr	603 11.5 SR	571 12.2 Pt	555 13.8 Bm	602 12.1 Pt
556[11.5 Bl	591 8.4 Kg	U CYG	601 12.3 Pt	571[12.0 Pt	S IND
RU AQL	592 7.6 Cv	201547	V VUL	601[12.3 Pt	*204954*
200812	594 8.3 Hf	518 9.6 Ch	203226	T DEL	540[13.5 Bl
544 14.0 L	594 7.2 Jo	547 9.8 Cy	571 8.5 Pt	204016	X DEL
569 12.8 Be	596 7.3 Jo	549 9.7 Wd	601 8.6 Pt	571[12.2 Pt	205017
603 10.4 Jo	596 8.3 Kg	552 10.0 Ch	Y DEL	591 14.3 Wa	555 12.5 L
W CAP	600 7.2 Jo	556 9.3 Wd	203611	601[12.2 Pt	568 13.2 Hu
200822	601 7.1 Pt	556 9.5 Hf	544[14.5 L	U DEL	568 13.2 Ar
540[11.6 Bl	603 7.4 Hz	559 9.6 Jo	S DEL	204017	571 12.7 Pt
571[12.5 Pt	R DEL	562 10.5 Mc	203816	538 7.1 Lt	UX CYG
601 13.1 Pt	201008	563 9.4 Ra	556 9.8 L	543 7.0 Lt	205030a
	536 9.3 Ah	563 9.0 Jo	563 10.4 Jo	566 7.2 Lt	596[12.0 Jo

Variable Star Observations Received During May and June, 1934.

J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs. J.D.Est.Obs.

R Vul
205923a
536 9.2 Ah
543 9.1 Ah
549 8.5 Ah
559 7.9 Jo
563 8.0 Jo
564 8.2 Ah
565 8.3 Hf
566 8.3 Jo
569 8.3 Ah
570 8.4 Jo
571 8.1 Pt
574 8.5 Jo
577 8.7 Jo
581 8.9 Hf
584 9.3 Ah
588 9.4 Ah
594 9.6 Hf
596 10.0 Jo
600 10.7 Jo
602 10.3 Pt
603 11.0 Jo

TW Cyg
210129
533 11.6 L
555 9.4 Bm
557 9.6 L

X Cap
210221
602 11.5 Pt

X Cep
210382
571[13.9 Br

RS Aqr
210504
555 11.2 L
571 10.2 Pt
602 10.2 Pt

Z Cap
210516
529 [8.4 Bm

R Equ
210812
555 10.1 L
571 9.8 Pt
574 9.6 Jo
577 9.6 Jo
602 10.9 Pt

T Cep
210868
512 6.0 Ch
516 5.9 Ch
517 6.2 Ch
529 6.0 Kp
530 6.0 Se
530 5.7 Pk
530 6.2 Kp
532 6.7 Kp
535 6.5 Kp

T Cep
210868
535 6.4 Ah
535 6.0 Ar
536 5.9 Ko
536 6.2 Se
536 6.2 Ah
536 6.5 Kp
537 6.5 Kp
537 6.4 Ah
538 6.5 Kp
540 6.6 Kp
541 6.5 Kp
542 6.2 Kn
543 6.5 Ah
543 6.7 Kp
543 6.1 Rc
544 6.5 Ra
545 6.4 Ah
546 6.3 Kn
546 6.6 Hf
546 6.7 Kp
546 7.4 Si
547 5.9 Ar
548 5.5 Ko
548 6.9 Kp
549 6.7 Kp
549 6.4 Ah
550 6.1 Oy
550 6.2 Ar
550 6.5 Kp
552 6.5 Ah
552 6.3 Ch
553 6.4 Ah
555 5.9 Ar
555 6.5 Ah
555 6.4 Kp
556 6.3 Kn
556 5.7 Hf
557 6.5 Ah
558 6.5 Ah
558 6.4 Kn
559 6.5 Kn
559 6.0 Jo
560 6.5 Hq
560 6.5 Si
561 6.3 Ar
561 6.3 Oy
562 6.8 Mc
563 6.7 Ra
563 6.7 Rc
563 6.4 Jo
563 6.2 Ko
563 6.3 Ar
564 6.5 Ah
564 6.5 Oy
564 6.9 Mc
566 6.4 Jo
567 6.5 Si
568 6.5 Ar

T Cep
210868
568 6.5 Hu
569 6.9 Ra
569 6.8 We
569 6.7 Kn
569 6.5 Ar
569 6.7 Ah
570 7.3 Hf
570 6.7 Jo
571 6.4 Pt
571 7.1 Mc
573 6.5 Ar
573 6.8 Ah
574 6.9 Ah
574 7.0 Oy
574 7.3 Rc
574 6.6 Jo
575 6.5 Ar
576 6.6 Ar
577 6.6 Ar
577 6.5 Jo
577 6.5 Ko
578 7.0 Ra
580 6.7 Ar
581 7.5 Hf
581 7.1 Ah
584 6.9 Pb
584 6.8 Ar
584 7.2 Ah
585 6.8 Lf
585 6.8 Ar
585 6.8 Gw
585 7.6 Kp
586 6.4 Ar
587 6.8 Ar
587 6.3 Gw
587 7.1 Hu
588 7.5 Pk
588 8.0 Kp
589 7.9 Kp
589 7.1 Di
589 7.0 Ar
590 7.5 Kn
590 8.2 Mc
594 8.2 Hf
594 8.1 Kg
594 7.4 Jo
597 8.3 Rc
598 8.5 Mc
600 7.5 Jo
602 8.1 Pt

RR Aqr
210903
555 12.1 L
602 12.8 Pt

Y Pav
211570
541 5.8 Ht
563 5.8 Ht

X Peg
211614
555 9.8 L
571 9.4 Pt
574 9.0 Jo
602 10.0 Pt

W Cyg
213244
537 6.4 Se
590 6.6 Mc
598 6.4 Mc
600 6.4 Mc

S Cep
213678
545 10.4 Cy
546 10.6 Kn
558 10.8 Kn
559 10.5 Kn
559 9.5 Jo
563 9.4 Jo
563 10.9 Ra
565 10.9 Hf
565 10.5 Rc
566 9.5 Jo
569 10.8 Ra
569 10.4 Cy
570 9.6 Jo
570 10.6 Kn
570 10.9 Hf
574 9.5 Jo
577 9.6 Jo
581 10.7 Hf
590 10.2 Kn
593 9.9 Cy
594 10.3 Hf
596 9.0 Jo
600 9.3 Jo
602 8.5 Pt

RU Cyg
213753
536 9.1 Cy
546 9.8 Ry
547 10.0 Cy
559 9.4 Jo
563 9.6 Jo
566 9.5 Jo
568 10.0 Ry
570 10.0 Jo
570 10.1 Cy
571 9.1 Pt
574 9.9 Jo
577 9.7 Jo
578 10.1 Ry
582 10.0 Ry
584 9.7 Ry
590 8.5 Mc
596 9.4 Jo
600 9.3 Jo
602 8.8 Pt
603 9.4 Jo

RV Cyg
213937
571 6.6 Pt
602 6.8 Pt

RR Peg
214024
557 8.2 L
571 10.0 Pt
574 10.7 Jo
596 9.0 Jo
602 9.0 Pt

VV Cep
215363
564 5.5 Lt
568 5.5 Lt

TY Cep
215586
534 10.8 Br
542 10.5 Br
546 10.7 Br
571 10.5 Br

V Peg
215605
555 8.4 L
602 9.4 Pt

U Aqr
215717
602[13.2 Pt

TW Peg
215927
538 7.5 Lt
543 7.8 Lt
566 7.7 Lt
576 7.6 Lt
595 7.6 Lt

RT Peg
215934
533 10.4 L
557 12.5 L

RZ Peg
220133b
557[13.0 L

T Peg
220412
555 9.2 L

Y Peg
220613
555 12.6 L
555 13.6 Bm
602[12.5 Pt

RS Peg
220714
555 12.0 Bm
602[12.5 Pt

S Gru
221048
541[12.8 Ht

RV Peg
222129
555 10.9 L

S Lac
222439
533 8.2 L
543 8.2 Lt
548 7.8 Ko
557 8.2 L
563 8.5 Ar
566 8.9 Lt
566 8.7 Jo
570 8.7 Jo
575 8.7 Ko
581 9.4 Hf
587 10.2 Hu
587 10.0 Ar

R Ind
222867
534 8.8 Bl
541 10.0 Ht
547 9.9 Bl
555 10.2 Bl

W Cep
223257
566 7.5 Lt
571 7.6 Lt

T Tuc
223162
541 13.1 Ht

R Lac
223841
533 14.0 L

RW Peg
225914
555 9.7 L
571 10.5 Pt
591 12.1 Wp
591 12.2 Wa
602[12.1 Pt

R Peg
230110
577 12.5 Ar
587 11.6 Ar
587 11.5 Hu
594 11.5 My
596 11.4 Jo
597 11.4 My
602 11.5 Pt

V Cas
230759
501[10.9 Ch
545 11.4 Cy
570 9.6 Cy
570 10.2 Kn
571 9.6 Pt
573 10.0 Ah
574 9.7 Ah
574 9.6 Jo
574 10.0 Kn
577 9.3 Jo
581 9.2 Hf
584 9.2 Ah

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.	J.D.Est.Obs.
V CAS	S PEG	Z AND	ST AND	R AQR	R CAS
230759	231508	232848	233335	*233815*	235350
588 8.9 Ah	602 12.0 Pt	577 10.7 Ar	552 9.4 Cy	602 10.5 Pt	584 10.2 Ar
590 8.9 Kn	RY CEP	579 10.8 Cy	570 9.8 Jo	RR CAS	587 9.7 Ar
593 9.4 Cy	231878	580 10.8 Ar	574 10.0 Jo	235053	587 10.0 Hu
594 9.1 Hf	501 9.2 Ch	584 10.8 Ar	576 9.1 Cy	557[11.4 Bn	588 9.7 Gw
596 8.4 Jo	Z AND	584 10.8 Pb	593 10.4 Cy	590 11.9 Ra	590 10.4 Ra
600 8.5 Kn	232848	587 10.8 Hu	594 10.1 My	R CAS	594 10.1 Hf
602 8.6 Pt	545 10.8 Cy	587 10.7 Ar	596 10.0 Jo	235350	Z PEG
W PEG	552 10.9 Cy	593 10.7 Cy	597 10.3 My	501[11.4 Ch	235525
231425	571 10.9 Pt	596 10.7 Jo	602 10.3 Pt	563 11.2 Ar	602[12.5 Pt
596 9.5 Jo	575 11.2 Ko	600 10.7 Jo	603 10.4 Jo	576 10.6 Ar	Y CAS
600 9.8 Jo	575 10.9 Cy	602 10.6 Pt		580 10.5 Ar	235855
603 10.0 Jo	576 10.7 Ar	603 10.6 Jo		581 10.1 Hf	574 10.3 Jo
				584 10.1 Pb	590 11.8 Ra

RAPIDLY VARYING IRREGULAR VARIABLES.

Star J.D. Est.Obs.	J.D. Est.Obs.	Star J.D. Est.Obs.	J.D. Est.Obs.
005840 RX ANDROMEDAE—		060547 SS AURIGAE—	
7505.1 11.5 Ch	7580.9 11.8 Pt	7575.6 12.9 Wa	7583.5[11.0 Ry
7510.1 11.3 Ch	7582.5 12.9 Ry	7575.7 12.4 Hi	7588.6 14.6 Wa
7568.6[11.3 Ry	7583.9 12.4 Pt	7576.7 12.9 Hi	7590.6[13.2 Wa
7573.9 11.5 Pt	7587.5[11.3 Ry	7577.7 13.5 Hi	7591.6[13.9 Wa
7575.9 12.0 Pt	7602.9 12.6 Pt	7578.4[12.5 Ry	7592.6[13.0 Wp
020356 UV PERSEI—		7581.6[13.2 Wp	7593.6[13.0 Wa
7530.7[13.5 Br	7536.7[12.7 Br	074922 U GEMINORUM—	
7531.7[13.7 Br	7538.7[12.7 Br	7503.1 14.2 Bm	7545.7 14.1 Br
7533.7[13.5 Br	7539.7[12.7 Br	7507.1 14.1 Bm	7546.2 14.2 Ch
7534.7[12.7 Br	7552.7 12.8 Br	7508.2 14.0 Ch	7546.3 14.1 L
060547 SS AURIGAE—		7510.2 14.0 Ch	7546.7 14.1 Br
7500.1 14.5 Bn	7557.7[12.5 Hi	7513.2 14.1 Ch	7550.1[11.4 Ch
7507.1 14.7 Bm	7558.6 14.6 Wa	7515.1 14.3 Bm	7551.6[12.8 B
7510.1 14.0 Ch	7558.6 14.5 Wp	7519.1[13.7 Bm	7552.1[13.7 Bm
7514.1 14.0 Ch	7559.6 14.2 Wa	7526.1[13.3 Bm	7553.6[13.3 Ar
7520.2 11.3 Ch	7559.6 14.3 Wp	7530.7[13.8 Br	7554.1[13.7 Bm
7522.2 11.5 Ch	7560.7[13.2 Hi	7531.7[14.5 Br	7558.6[12.4 Cy
7530.7 13.8 Br	7561.7[13.2 Hi	7532.3 14.2 L	7559.6[13.8 GC
7531.7 14.6 Br	7562.6 14.5 Wa	7533.7[13.8 Br	7560.6 13.9 Ar
7532.7 13.9 Hi	7563.6[13.8 Wa	7534.7 14.5 Br	7561.6 13.8 Ar
7533.1 14.0 Ch	7564.7[13.2 Hi	7535.6[12.4 Cy	7562.6[13.9 B
7537.6 14.2 B	7565.6[13.9 Wa	7536.2 14.0 Ch	7563.6[13.9 B
7537.6 14.6 Pf	7566.6 14.6 Wa	7536.6 13.9 Ar	7564.7[12.4 Pt
7540.3 14.2 Be	7567.7[13.2 Hi	7537.6[12.4 Cy	7565.6 14.0 GC
7542.3 14.3 L	7568.4[12.5 Ry	7538.7 14.2 Br	7566.6[13.8 GC
7542.6 14.2 Wa	7569.6 12.2 Wa	7539.7 14.5 Br	7567.4 14.3 Be
7543.3 14.7 L	7569.6 12.3 Wp	7540.4 14.0 Be	7569.7[12.4 Pt
7544.3 14.4 L	7569.7 12.3 Pt	7541.6 14.0 B	7570.6[13.8 GC
7544.6 14.2 Wa	7570.6 11.0 GC	7542.4 14.4 L	7571.8[12.4 Br
7545.3 14.5 L	7570.6 10.8 Wa	7542.7 14.2 Br	7572.8[12.4 Br
7546.3 14.4 L	7570.6 11.0 Wp	7543.3 14.1 Be	7573.8[13.3 SR
7547.7[13.2 Br	7570.7 10.9 Hi	7543.3 14.2 L	7574.7[12.4 Pt
7548.7[13.8 Br	7571.4 11.2 Ry	7544.3 14.2 L	7581.6[12.8 B
7549.7[13.2 Br	7571.7 11.2 Hi	7544.7 14.2 Da	7587.7[11.2 Pt
7550.1[12.5 Ch	7572.4 11.3 Ry	7545.3 14.3 L	7588.7[12.4 Pt
7551.7[13.2 Hi	7572.7 11.5 Hi	7545.6 14.0 Ar	7589.7[11.7 Pt
7552.1[13.0 Bm	7573.6 11.6 Gv	081473 Z CAMELOPARDALIS—	
7553.6[13.2 Wa	7573.7 11.5 SR	7510.1 13.0 Ch	7531.7 13.5 Br
7554.1[13.2 Bm	7573.7 11.9 Hi	7514.2 10.8 Ch	7533.7 13.4 Br
7555.3[13.9 L	7574.7 12.0 Hi	7517.2 11.4 Ch	7534.7 13.5 Br
7556.3[13.9 L	7575.4 12.2 Ry	7530.7 13.6 Br	7536.1 13.1 Ch

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
081473 Z CAMELOPARDALIS—						
	7536.7	13.3	Br	7569.7	12.3	Pt
	7536.8	12.8	Cy	7569.8	12.8	Br
	7537.6	12.7	Cy	7570.6	12.0	Jo
	7538.7	11.3	Br	7570.5	12.8	Ry
	7539.7	10.6	Br	7570.6	12.7	GC
	7542.6	11.5	Ko	7570.6	12.7	Cy
	7542.7	11.2	Br	7570.8	12.9	Br
	7543.5	11.6	Ry	7570.8	12.8	Wd
	7543.7	11.6	Pt	7571.8	12.9	Br
	7544.6	11.6	Ko	7572.8	13.0	Br
	7544.7	11.9	Pt	7573.4	12.8	Ry
	7545.7	12.2	Br	7573.6	12.6	Gy
	7545.7	12.0	Cy	7573.9	13.3	Pt
	7546.5	12.3	Ry	7575.5	13.1	Ry
	7546.7	12.6	Br	7575.7	12.7	Cy
	7547.7	12.8	Br	7575.7	12.5	Pt
	7548.7	12.9	Br	7577.8	12.3	Wd
	7549.5	12.9	Ry	7577.8	12.3	Br
	7549.7	12.8	Br	7578.4	11.5	Ry
	7552.9	12.7	Cy	7578.7	10.6	Wd
	7553.4	12.8	Ry	7578.7	10.8	Cy
	7553.6	12.9	GC	7578.8	10.8	Br
	7556.6	12.4	GC	7578.9	10.9	Pt
	7558.6	11.2	Cy	7579.8	10.6	Wd
	7558.6	11.4	GC	7580.8	10.9	Br
	7558.6	11.3	Ko	7580.9	10.7	Pt
	7558.7	10.4	Wd	7581.8	11.1	Cy
	7559.6	11.1	Cy	7582.5	11.3	Ry
	7559.6	10.6	GC	7584.7	11.7	Wd
	7559.6	10.9	Gy	7584.8	11.9	Br
	7560.7	10.9	Gy	7585.8	12.0	Wd
	7560.7	11.1	Pt	7586.5	12.2	Ry
	7560.8	10.5	Wd	7586.7	12.3	Wd
	7562.6	11.5	Ko	7586.8	12.1	Br
	7562.7	11.5	Pt	7587.5	12.4	Ry
	7563.6	11.6	Ko	7587.7	12.5	Pt
	7563.9	11.6	SR	7588.6	12.7	Gy
	7564.5	11.8	Ry	7589.7	12.8	Pt
	7564.7	11.5	Pt	7591.6	12.6	GC
	7565.5	12.2	Ry	7592.6	12.4	GC
	7565.6	12.3	Cy	7592.7	13.0	Pt
	7565.6	12.2	Ko	7596.8	12.4	Pt
	7565.6	12.0	Jo	7597.7	13.1	SR
	7565.6	12.3	GC	7599.7	13.0	Gy
	7565.7	12.2	Pt	7601.7	12.3	SR
	7566.6	12.4	GC	7601.8	12.5	Pt
	7567.7	12.3	Pt	7602.7	12.1	Pt
	7567.8	12.8	Br	7603.7	11.0	SR
	7568.5	12.8	Ry	7603.7	11.6	Jo
	7569.6	12.7	Cy			
094512 X LEONIS—						
	7530.7	13.5	Br	7563.7	12.0	SR
	7533.7	13.5	Br	7564.6	12.3	So
	7536.7	12.3	Br	7564.7	11.7	Pt
	7538.7	12.3	Br	7567.7	12.7	Pt
	7539.7	12.5	Br	7567.8	12.3	Br
	7542.7	13.5	Br	7569.7	13.0	Br
	7548.7	13.3	Br	7573.7	12.3	SR
	7563.6	12.0	Ar	7581.6	12.5	B

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
094512 X LEONIS—						
	7587.7	11.8	Pt	7597.7	12.3	SR
	7589.7	11.8	Pt	7601.7	12.3	SR
	7590.6	13.0	B	7602.7	11.8	Pt
	7595.7	12.3	SR	7603.7	12.3	SR
174406 RS OPHIUCHI—						
	7518.4	12.7	Ch	7577.7	11.8	Jo
	7541.4	12.2	Ht	7577.7	11.9	Wa
	7542.8	11.9	Wp	7577.8	11.7	Cy
	7542.8	11.9	Wa	7578.8	11.6	Cy
	7545.8	12.1	Cy	7581.7	11.8	Hf
	7546.6	11.6	L	7581.7	11.8	Wd
	7548.8	11.9	Ko	7581.8	11.5	Cy
	7551.8	12.8	Cy	7582.5	11.6	Ry
	7552.9	12.0	Cy	7588.6	11.7	Wa
	7553.8	11.8	Cy	7588.6	11.6	Fi
	7555.5	11.9	L	7588.6	11.5	Wp
	7556.8	12.0	Wp	7588.7	11.7	Cy
	7556.8	12.0	Wa	7589.6	11.8	Wa
	7563.4	12.2	Ht	7590.8	11.8	Ra
	7563.7	12.0	Wa	7591.7	11.8	Wa
	7563.8	11.7	Jo	7591.7	11.7	Wp
	7564.7	11.6	Pt	7592.9	11.6	Pt
	7565.8	12.4	Cy	7593.6	11.9	Wa
	7566.8	12.0	Cy	7593.6	11.9	Wp
	7566.8	12.1	Ra	7594.6	12.0	Wa
	7567.7	11.9	Pt	7594.7	11.7	Jo
	7569.7	12.5	Cy	7595.7	12.0	SR
	7570.7	11.8	Cy	7596.6	11.8	Wa
	7570.7	12.2	Wa	7596.7	11.6	Jo
	7570.8	11.8	Jo	7597.7	12.0	SR
	7573.7	12.3	Gy	7599.6	11.9	Wa
	7573.7	12.1	Cy	7599.7	12.2	Gy
	7574.7	11.8	Jo	7600.7	11.6	Jo
	7575.8	12.1	Ko	7601.6	11.9	Wa
	7575.8	12.1	Cy	7601.7	11.8	SR
	7576.8	11.8	Cy	7603.7	12.0	SR
	7577.7	11.9	Wp	7603.6	11.6	Jo
202946 SZ CYGNI—						
	7564.7	9.0	Pt	7588.7	9.6	Pt
	7565.6	9.0	Pt	7589.7	9.2	Pt
	7567.6	9.6	Pt	7592.7	9.0	Pt
	7573.7	9.5	Pt	7596.7	9.2	Pt
	7575.7	9.6	Pt	7597.7	9.4	Pt
	7578.7	8.9	Pt	7599.7	9.5	Pt
	7580.9	9.0	Pt	7601.9	9.3	Pt
	7583.8	9.6	Pt	7602.9	9.5	Pt
	7587.7	9.8	Pt			
213843 SS CYGNI—						
	7516.5	9.4	Ch	7547.9	12.2	Ar
	7518.5	10.1	Ch	7548.8	12.1	Ko
	7520.5	10.4	Ch	7551.8	11.9	Cy
	7522.5	11.4	Ch	7552.4	11.7	Ch
	7533.6	11.8	L	7552.9	12.0	Cy
	7535.9	12.0	Ar	7554.8	12.1	Ar
	7542.8	12.1	Wa	7555.6	12.1	L
	7542.8	12.2	Wp	7555.9	12.1	Ar
	7543.6	11.8	Ah	7556.8	12.1	Wa
	7545.8	12.0	Ly	7557.6	11.8	L
	7547.9	12.0	Cy	7559.9	11.9	Ar

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

Star	J.D.	Est.Obs.	J.D.	Est.Obs.	Star	J.D.	Est.Obs.	J.D.	Est.Obs.
213843 SS CYGNI—					213843 SS CYGNI—				
	7561.8	11.9 Ar	7575.7	11.6 Pt		7585.7	8.4 Gw	7591.7	9.8 Wa
	7563.7	11.9 Jo	7575.8	10.5 Ko		7585.8	8.7 Ar	7592.7	10.0 Wp
	7563.8	12.0 Ar	7575.8	10.1 Cy		7586.8	8.8 Ar	7592.7	10.5 Pt
	7563.8	12.2 SR	7576.6	8.5 Jo		7587.7	8.8 Ar	7592.7	10.1 Cy
	7563.9	11.9 Ra	7576.8	8.3 Cy		7587.7	8.3 Gw	7593.6	10.9 Wp
	7564.5	12.0 Ah	7576.9	8.6 Ar		7587.7	8.9 Pt	7593.6	10.8 Wa
	7564.7	11.7 Pt	7576.9	8.9 Pt		7587.8	8.6 Hu	7593.8	10.3 Cy
	7565.6	11.7 Pt	7576.9	8.4 Ra		7587.8	8.7 Hk	7594.6	11.0 Wp
	7565.9	12.0 Cy	7577.6	8.1 Jo		7588.5	8.6 Ah	7594.6	11.0 Wa
	7566.7	11.9 Jo	7577.7	8.2 Wa		7588.7	8.7 Wp	7594.6	11.1 Fi
	7566.8	11.9 Cy	7577.7	8.4 Wp		7588.7	8.7 Wa	7594.7	11.0 Hf
	7568.8	12.0 Ar	7577.7	8.1 Cy		7588.7	8.6 Fi	7594.7	10.7 Fd
	7568.8	12.0 Hu	7577.7	8.4 Ar		7588.7	8.7 Cy	7595.7	11.6 SR
	7568.9	12.0 Pk	7577.9	8.3 Bo		7588.7	8.9 Ar	7596.6	11.9 Jo
	7569.5	11.8 Ah	7578.7	7.9 Cy		7588.7	9.0 Pt	7596.6	11.6 Wa
	7569.7	12.0 Cy	7578.9	8.5 Pt		7588.7	8.4 Gw	7596.8	11.8 Pt
	7569.8	12.0 Ar	7579.8	7.8 Cy		7588.8	8.3 Ra	7597.6	12.0 Jo
	7569.8	12.1 Ra	7580.8	8.4 Ar		7589.6	9.4 Wa	7597.7	11.8 Pt
	7569.9	12.1 Ar	7580.9	8.6 Pt		7589.7	9.2 Di	7597.7	11.8 SR
	7570.7	12.0 Cy	7581.4	8.2 Ah		7589.7	8.9 Cy	7598.9	11.6 Wy
	7570.8	11.9 Wa	7581.6	8.3 Wp		7589.7	8.6 Gw	7599.6	11.9 Wa
	7570.8	12.0 Wp	7581.6	8.4 Wa		7589.7	9.2 Pt	7599.7	11.7 Pt
	7571.7	12.0 Ar	7581.6	8.4 Fi		7589.8	9.4 Ar	7600.6	11.9 Jo
	7573.1	11.4 Hr	7581.7	8.1 Wd		7590.6	9.4 Wp	7601.6	11.9 Wa
	7573.4	11.8 Ah	7581.8	8.2 Hf		7590.6	9.7 Wa	7601.7	11.8 SR
	7573.7	11.7 Pt	7581.8	7.9 Cy		7590.7	10.0 Mc	7601.8	12.0 Pt
	7573.7	11.7 Cy	7583.9	8.4 Pt		7590.7	9.5 Cy	7602.7	11.8 Pt
	7573.7	12.1 Ar	7584.5	8.5 Ah		7590.8	9.4 Ra	7603.6	11.9 Jo
	7574.6	11.9 Jo	7584.8	8.7 Ar		7591.7	9.8 Cy	7603.7	11.5 SR
	7575.6	11.5 Wa	7584.8	8.6 Pb		7591.7	9.9 Wp		
	7575.7	11.4 Ar	7585.7	8.7 Lf					

SUMMARY FOR MAY AND JUNE, 1934.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Ahnert	Ah	29	186	Georgetown	GC	19	43
Armfield	Ar	57	250	Goodsell	Gs	2	3
Baldwin	Bl	85	152	Gregory	Gy	29	77
Ballhaussen	Ba	5	26	Grunwald	Gw	13	35
Bappu	Bm	31	109	Halbach	Hk	2	2
Belsham	BH	12	18	Harper	Hq	3	4
Benini	Be	33	45	Hartmann	Hf	79	275
Bouton	B	57	73	Hassler	Hz	18	24
Boyd, A. F.	Bo	3	3	Heines	Hh	3	5
Brocchi	Br	58	168	Hildom, A.	Hi	11	38
Brown	Bn	3	6	Houghton	Ht	79	317
Buckstaff	Bc	2	3	Houston	Hu	25	30
Chandra	Ch	204	379	Hurahata	Hr	4	9
Cilley	Cy	73	299	Jansen	Je	9	31
Davis	Da	5	5	Jones	Jo	141	704
Dieter	Di	5	5	Kaho	Ka	1	4
Ensor	En	81	257	King	Kg	12	29
Field	Fi	11	16	Kirkpatrick	Kp	10	100
Fish	Fs	7	22	de Kock	Dk	6	47
Ford	Fd	6	6	Kohman	Ko	36	118
Flower Obs.	FO	17	19	Koons	Kn	18	76
Friton	Fn	4	10	Lacchini	L	150	220
George	Gg	4	4	Loepfe	Lf	4	4

VARIABLE STAR OBSERVATIONS RECEIVED DURING MAY AND JUNE, 1934.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Loreta	Lt	25	105	Scanlon	So	15	19
Lucas	Lu	9	38	Schenkman	Se	9	16
Luechinger	Lr	2	3	Shinkfield	Sl	28	77
McKnelly	My	20	56	Shultz	Sz	14	20
McLeod	Mc	29	98	Simpson	Si	8	35
Millard	Md	3	5	Skora	SR	21	59
Miller	Mi	10	13	Smith, L.	Sh	32	61
O'Byrne	Oy	13	50	Smith, F. P.	Sq	21	50
Parthe	Pa	12	26	Smith, F. W.	Sf	9	14
Peck	Pb	7	7	Wade	Wh	5	5
Peltier	Pt	189	420	Walton	Wu	5	6
Perkinson	Pk	21	50	Watson	Wa	48	171
Preucil	Pf	5	9	Webb	Wd	56	130
Raphael	Ra	78	148	Wetherbee	We	8	8
Recinsky	Rc	15	58	Whitney	Wy	7	7
Richards	Ri	4	5	Williamson	Wg	3	4
Rosebrugh	Rb	15	50	Wilson	Wx	12	38
de Roy	Ry	10	48	Woods	Wp	31	106
Ruben	Ru	5	14				
Salanave	Sx	27	60	Totals		84	444	6345

maximum brightness, 6.0. Whether this slight drop of a few tenths of a magnitude is a precursor of a much more marked decline to minimum remains to be seen and from the appearance of the list of observations of this star published in the accompanying report it does not look as if R Coronae Borealis could decrease very much in brightness without such a variation being detected by our members.

LEON CAMPBELL, Recorder.

July 9, 1934.

Comet Notes

By G. VAN BIESBROECK

The first half of the year has gone by without any addition to the list of new objects. Those that were followed from last year are no longer in reach so that no comets have been under observation for some time. However, the recovery of PERIODIC COMET ENCKE has just been announced. It was found by H. M. Jeffers at the Lick Observatory, who sent out the following telegraphic information:

1934 July 10.4371 $\alpha = 3^h\,48^m\,46^s$ $\delta = +27^\circ\,44'$ Magnitude 15 — Diffuse.

On receiving this message a pair of earlier plates taken by the writer with the 24-inch reflector of the Yerkes Observatory was examined and the object readily found:

1934 July 8.34771 $\alpha = 3^h\,41^m\,11^s.24$ $\delta = +27^\circ\,16'\,7''.7$ Magnitude 16.

The object appears as a round diffuse coma some 15″ in diameter with scarcely any condensation. Its image is well measurable on the second plate of that morning but the first one taken at lower altitude is so much weaker that the identity remained unconfirmed until Jeffers' announcement came.

In referring to the search ephemeris given on p. 334 it will be seen that the observed position is between the two values assumed for the time of perihelion passage but nearer to T = Sept. 15 than to Sept. 17.

A considerable amount of numerical work has been done on the orbit of this object at the Poulkova Observatory. A circular dated June, 1934, has just been

received from that institution giving the results by two independent computers. They found a slightly different value for the acceleration in the mean motion so that two ephemerides were given although the difference in the predicted places does not exceed two minutes of arc. Both ephemerides are very close to the observations. That by N. Idelson is slightly better than that by L. Matkiewicz. In the former case the difference, observation minus computation, is only:

$$-6^s.6 \qquad -17''$$

This small residual can be accounted for by advancing the time of perihelion by 0.053 days, a change of only $1^h\,16^m$ in the prediction. The corrected time becomes 1934 September 15.278 U.T.

The period of this comet, three and one-third years, is still the shortest known. This is now the thirty-eighth return to visibility since the discovery by Méchain in 1786. The comet has been observed at every intermediate return so that its motion has been closely watched for a century and a half. This has brought out a slow, continuous but not uniform decrease of the period, a phenomenon which is yet unexplained. In order to study this anomaly further the computers make an appeal to observers asking them to extend the observations as far as possible on either side of the perihelion on September 15. A good beginning has been made since the comet has been recovered more than two months before that date. The object is however not favorably situated. It will remain a morning object this summer, rising well after midnight and never visible except at low altitude before sunrise. The brightness is expected to increase and to reach perhaps 8th magnitude in the beginning of September. After that the comet will be lost in the vicinity of the sun to reappear for southern observers in the latter part of the year. The following ephemeris has been obtained by applying to

EPHEMERIS FOR COMET ENCKE IN 1934.

1934 0^h.U.T.		α h m s	δ ° ′ ″	—Distance from— Sun	Earth
July	13	3 58 31	+28 17 47	1.340	1.808
	15	4 6 29	28 43 15		
	17	14 46	29 7 52	1.282	1.734
	19	23 25	29 31 29		
	21	32 27	29 53 53	1.222	1.663
	23	41 53	30 14 45		
	25	4 51 44	30 33 49	1.160	1.593
	27	5 2 1	30 50 43		
	29	12 46	31 5 7	1.097	1.528
	31	24 0	31 16 35		
Aug.	2	35 42	31 24 37	1.033	1.467
	4	5 47 55	31 28 46		
	6	6 0 37	31 28 30	0.966	1.412
	8	13 50	31 23 11		
	10	27 31	31 12 14	0.898	1.362
	12	41 40	30 54 58		
	14	6 56 15	30 30 47	0.827	1.320
	16	7 11 14	29 59 12		
	18	26 35	29 19 39	0.755	1.286
	20	42 14	28 31 35		
	22	7 58 8	27 34 34	0.682	1.263
	24	8 14 14	26 28 21		
	26	30 29	25 12 46	0.608	1.251
	28	8 46 49	23 47 46		
	30	9 3 13	22 13 21	0.533	1.250
Sept.	1	19 38	20 29 36		
	3	9 36 5	+18 36 40	0.461	1.260

Idelson's figures the small correction required for taking into account the slight modification in the time of perihelion indicated above.

Williams Bay, Wisconsin, July 16, 1934.

Meteor Notes from the American Meteor Society

By CHARLES P. OLIVIER, President

Because of various duties in connection with the ending of the University session, the writer has not been able to prepare the usual personal "notes" for this issue, but depends upon other members of the Flower Observatory staff. However, he does desire to call attention to the excellent condition for an intensive study of the Perseid stream: the Moon is new on August 10. We plan in this region a considerable campaign to determine heights.

It is evident from preliminary reports that several of our observers had good fortune on the Eta Aquarids in May. Our most interesting report on the Lyrids came from C. H. Brown, Baltimore, Md., who sent in a photograph containing two Lyrid meteors.[9] They appeared at 12:25 and 12:30 on the night of April 21-22. Several of our members have been able to photograph meteors of late, so that more information is being made available on this work, which in the past has been disappointing considering the time and effort spent upon it.

Meteor Heights, 1933 Leonid Epoch

CONTINUATION OF PART II. STATE GROUPS.

By DORIS M. WILLS

Heights computed from observations by the Ohio and Southern Appalachian groups are given in the accompanyng tables. Table I gives the Southern Appalachian results. Heights for twenty-three meteors were computed here, and six of these were also computed by Bunch at Knoxville, using the same method, the graphical construction with altitudes and azimuths described in A.M.S. Reprint No. 11.

Eight stations took part in the Southern Appalachian observations:

1. Knoxville, Tenn.—S. Bunch (Group Organizer), R. Rusk, and A. Tonkin.
2. Jefferson City, Tenn.—F. Weed, Jr.
3. Maryville, Tenn.—B. Alexander.
4. Franklin, Ky.—L. J. Wilson.
5. Louisville, Ky.—Louisville Astronomical Society.
6. Bristol, Tenn.—W. Jones.
7. Cohutta, Ga.—P. O. Parker.
8. Nashville, Tenn.—A. Martin.

Coöperative work was undertaken on all three nights, November 14-15, 15-16, and 16-17, but heights could be found only for meteors plotted on the first two.

Although the method used here was the same as that used by Bunch, our procedures differed somewhat: here we assumed that a time-difference of more than thirty seconds meant that the observations could not be of the same meteor. Bunch combined some observations with time differences considerably greater than this, assuming that the time records were wrong. Some of the differences between his heights and ours are caused by the resulting different identifications of duplicates.

Four meteors have been included in the table which would have been partly or entirely omitted had not Bunch computed heights also—numbers 1 and 5, and the beginning points of numbers 6 and 8. For our results the average deviations

TABLE I.

No.	Date 1933 Nov.	Time C.S.T.	Ave. Est. Mag.	Beginning Height km.		Beginning Height by Bunch km.	End Height km.		End Height by Bunch km.	Stations	Class
1	14-15	12:16:15	2	120	48[1]	114	91	41	85	4,5	L
2		12:20:29	—2	137	8		94	15		1R,8	L
3		12:33:55	0	145	5		106	9		1T,4	L
4		12:41:07	2	156	25		74	9	67	4,5	S
5		12:45:30	0	173	29	164	139	56	121	4,5	S?
6		12:55:15	0.5	(115)	*	112.5	106	*	104	1T,5	L
7		13:16:10	—1.5	125	14	127	27	13	30	1B,4[2]	S
8		13:23:54	2.5	208	111		232	18	227	1T,5[3]	S
9	15-16	12:04:11	0.5	122	22		112	8		1B,5	L
10		13:13:25	1	...	..		58	2		1B,2	S?
11		13:18:21	0.5	165	9		159	29		1T,5	L
12		13:20:05	1.7	...	..		108	13		1B,2,3	S
13		13:40:34	2	138	18		95	24		1R,5	L
14		13:45:15	1.3	92	12		58	6	64	1B,2,3[4]	S
15		14:06:00	—1	61	*		..	..		5,8	S
16		14:18:15	5	41	7		42	12		4,8[5]	S
17		14:29:13	1	123	5		137	32		1B,6[6]	L
18		14:32:38	2.5	...	..		89	15		4,5	S
19		14:38:26	2	111	32		72	7		1B,6	L
20		14:45:45	2	137	23		124	25		1B,6	L
21		14:52:59	2	172	3		104	11		1B,5	L
22		15:15:10	1	102	4		77	4		1B,6	L
23		15:44:50	2	104	5		80	4		1B,6	L

* Graphical solution; no mean deviation found.

[1] Average deviation from the mean; not "probable error."

[2] Bunch used also an observation from station 3, and one from 5, which were not found here to be the same meteor.

[3] A rising meteor from our computations; an unusually high but falling one from Bunch's.

[4] Bunch used stations 1 and 2 only.

[5] Very doubtful height; base line short.

[6] Rising; end point probably wrong.

from the means are so large that we suspect the meteors of being different. In general, our mean heights agree reasonably well with those reported by Bunch, who did not send in his average deviations.

Like most other coöperative groups observing in 1933 Leonids, the Southern Appalachian stations included some inexperienced observers. Heights obtained from their later work will be appreciably more reliable, with more certain identifications and better plotting. These observers have been carrying out coöperative plans this spring with care and industry.

Table II gives fifteen heights computed from observations by the Ohio group under Dr. Lincoln La Paz. Although observations were made throughout the Leonid epoch by La Paz himself, coöperative work was undertaken only on November 16-17.*

The cooperating stations and personnel were as follows:

1. Columbus, Ohio.—L. La Paz. Recorders, A. Hammerschmidt and D. Dietrich. For 1B, observer A. Brenner. For 1G, observers W. Z. Gordon and W. C. Lorenz.

*The maximum of the shower was observed by La Paz between 16^h and 17^h on November 15-16. His total time and rate were erroneously reported by us in Meteor Notes for February, p. 99, as 520 minutes and 7.2 meteors per hour. The correct numbers are 320 minutes and 11.6 meteors per hour.

2. Bellfontaine, Ohio.—S. W. Whitt, G. E. Menges, N. E. Schoewe, and H. L. Davis.
3. Lancaster, Ohio.—J. G. Svehla, R. Beer, H. Heil, F. Heimbrook, and K. Kramer.
4. Near Sunbury, Ohio.—W. A. Patterson, L. D. Rodabaugh, H. Blake, and T. H. Southard.
5. Cleveland Heights, Ohio.—J. L. Black.

All stations except 5 were manned by observers from Columbus.

Duplicate observations were identified by a radio signal sent over WOSU by La Paz, which ceased when the meteor disappeared. Note of the simultaneity of the cessation of the signal and the disappearance of a meter was made on the record sheets of observers at other stations. A list of fifteen such coincidences was sent in with the complete records; two of them with other Columbus observers only. One other proved to be erroneous: the meteors were unmistakably different.

Of the twelve possible heights from the coincidences, only eight could be found (times for these eight are marked with * in the table), and for three of these, only one end could be computed. Two meteors given in the table, numbers 9 and 11, were recorded by La Paz and by one other station which did not note his time signal. The identifications are therefore somewhat doubtful; they were made here on the basis of time records. The other five meteors were seen by cooperating observers other than La Paz; necessarily no radio check was available; the identifications were originally made here, on the basis of recorded times.

TABLE II

No.	Date 1933 Nov.	Time E.S.T.	Ave. Est. Mag.	Beginning Height km.		End Height km.		Station Numbers and Class (Leonid or Sporadic)	
1	16-17	14:21:27*	4	135	12'	68	4	1,1B,3,4.	L
2		14:25:08	2.5	124	28	113	8	1B,4.	L
3		14:30:18*	0	63	13	...	..	1,2.	L
4		14:38:38*	3	102	9	46	1	1,1B,4.	L
5		14:40:45*	1	...	..	66	17	1,3.	L
6		15:07:14	0.5	97	5	84	2	1G,2.	L
7		15:12:25*	4	103	13	111	11	1,4.	S?
8		15:13:30*	2	...	..	151	17	1,4.	S?
9		15:24:10	4	58	3	65	6	1,4.	S?
10		15:33:05*	1	74	9	15	4	1,1B,4.	L
11		15:46:45	2.5	76	7	40	9	1,2.	L
12		16:00:10*	1.3	94	9	59	10	1,1B,2,4.	S
13		16:04:14	1	226	33	175	2	1B,2.	S?
14		16:18:17	0.8	140	15	100	14	2,4.	L
15		16:57:15	3	75	1	46	19	1B,4.	L?

*Radio signals sent from Station 1 by La Paz were recorded at the other stations as simultaneous with the disappearance of the meteor.

[1] Average deviation from the mean; not "probable error."

Some of the average deviations as given in the table are rather large. La Paz himself reported that he doubted the value of the work because of the inexperience of the plotters (most had done no coöperative work before this) and the bitter cold in which they worked. His doubts seem to be justified. For subsequent height work, with the aid of radio signals, we offer the following suggestions, which would probably be made also by the Ohio observers themselves:

1. Acquire plotting skill before observing for heights. The number

of definitely identified duplicates for which no concordant heights could be found impresses upon us the vital need for accurate plots.

2. If possible, have an assistant whose sole purpose is to listen for the radio signals and verify the identification of the meteor to which they apply. The possible heights for which the time signal record was missing make us believe this to be desirable.

3. If possible, have signals sent from more than one of the cooperating stations. Otherwise the records must be examined as usual for all possible coincidences as indicated by time records alone.

As pioneers in using radio signals for identifying meteors, the Ohio observers are among our more fore-sighted members. Their work constitutes a real advance toward improvement in methods of observation. We are looking forward to further observations from them.

The Leonid records for the Arizona observers have just been received. We hope to publish heights obtained from them in the October or November issue.

Flower Observatory, University of Pennsylvania,
Upper Darby, Pennsylvania, 1934 July 5.

The Great Alberta Meteor of March 18, 1934*

The May number of POPULAR ASTRONOMY contained a short newspaper quotation concerning the huge meteor which passed over parts of Saskatchewan and Alberta, Canada, on the evening of March 18, 1934. As soon as the press reported this brilliant object, three investigations were started. Professor H. H. Nininger of Denver, Professor J. W. Campbell of Edmonton, and I, who am the Pacific Northwest representative of the A.M.S. at Eugene, Oregon, made separate requests that the newspapers ask observers to send certain data to them. The response was generous. In addition, some observers, unasked, sent descriptions to Dr. Chas. P. Olivier (president of the A.M.S.) and to Dr. P. M. Millman (University of Toronto).

The Pacific Northwest representative of the A.M.S., in addition to letters written directly to him, was kindly offered the use of all those received by Professor Nininger and Dr. Olivier with the understanding that he prepare a report on the fireball. His findings and conclusions follow.

The meteor was seen at about 8:35 P.M., M.S.T., from three Canadian provinces and three states of the United States. It was quite brilliant in eastern Saskatchewan. Regina reported that it appeared three or four times as bright as Sirius. Over Alberta, where it disappeared, it was a dazzling object. Some said it was as "light as day." One said, "As light as the streets of a big city at night." It was observed from numerous places in British Columbia, Washington, Idaho, and Montana.

From the data available it seems that the fireball was first noticed when about 150 miles almost due west of Regina, at a height of about 50 miles. It traveled 300 miles almost W.N.W. and disappeared about 80 miles almost S.S.W. of Edmonton, at a height of 15 or 20 miles. Its speed was approximately 40 miles per second.

On March 19 the newspapers of Alberta gave considerable space to the meteor news. The *Edmonton Journal* carried about a page of exciting descriptions and quotations from observers. The *Calgary Albertan* said, "It was one of the most awe inspiring celestial displays ever witnessed in this section of the world."

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*Abstract of a paper presented before the Society for Research on Meteorites, at Berkeley, California, June 20, 1934.

This object caused a great deal of excitement near the end of its visible flight. Thunder like crashes were heard by those almost under it; rumblings by those more distant. (It passed between Edmonton and Calgary but produced no audible effects at either place.) At many places the ground trembled and windows rattled violently. In some instances animals were badly frightened.

The number "three" was mentioned frequently in reports. Some saw three separate explosions; others, three pieces traveling together; those at a great distance, three flashes on the horizon like sheet lightning.

Alberta and Saskatchewan were at the time spotted here and there with local cloud coverings. Eastern Saskatchewan reports nearly all referred to the "cloud bank low on the western horizon." No accounts were received from western Saskatchewan. In some places in Alberta the fireball was seen to cross only short sections of clear sky; in others, there were clouds only on the horizon. It was raining at Edmonton but the light of the invisible meteor gave the impression of "dawn coming in rapid fire style."

Unlike many huge fireballs, this one left no enduring train for more than a few seconds. Many mentioned the long tail of sparks while the object was visible but added that everything disappeared after it went out. One said, "A train remained for a split second after the final explosion."

The calculated slope of descent is 6° or 7°. Descriptions seem to bear this out. "It was traveling across the southern sky parallel to the horizon and not losing altitude." "It seemed to be keeping the same height except at the very last it looked like it was sinking slightly."

Practically all reports mention colors indicating a high temperature. "Bluish green," "intense blue," and similar terms were used often.

Often observers' remarks gave clues as to the part of the sky in which they saw the meteor. It evidently passed only slightly north of the zenith at Lousana, Alberta, as one report stated that "shadows of all buildings were cast toward the south and *were very short*."

As far as is known no genuine meteorites have been found to date. Some have sent in "suspected" rock specimens as is always the case after a big fireball is seen.

J. HUGH PRUETT.

Eugene, Oregon.

Notes from the Society for Research on Meteorites

Edited by FREDERICK C. LEONARD, President, and H. H. NININGER, Secretary

Some Remarks Concerning the Program of the Society for Research on Meteorites*

By FREDERICK C. LEONARD

The Society for Research on Meteorites has now virtually completed the first year of its existence. In the course of that short time it has, I think, adequately acquitted itself. Unquestionably, the organization has rendered some service to the science of meteoritics by stimulating interest and fostering research in this important pioneer field. The present address is intended to be, not a recital of the initial year's work and accomplishments of the Society, but rather, as the title implies, a few brief comments on the program of the association and suggestions

*The opening address of the President of the Society, delivered at its Second Annual Meeting, held at the University of California, Berkeley, June 18 and 20, 1934.

for its further development.

At the organization meeting of the Society held in Chicago in August, 1933, the President was instructed by the charter members present to appoint three committees of the Society. The committees appointed at that meeting were those on (1) Terminology; (2) Exhibits; and (3) Questionnaires. Since then the creation of five additional committees has seemed expedient, and so the Executive Committee of the Council has recently named committees on (1) Classification; (2) Discovery, Identification, and Analysis; (3) Relations between Meteors and Meteorites; (4) Collections; and (5) Meteoritic Features of the Earth's Surface. It may confidently be expected that the investigational activities of the Society will in future revolve largely around the aforesaid eight committees and any others that may later be established.

We are now publishing in our *Notes* in POPULAR ASTRONOMY what we call the "Bibliography of Meteoritics." Three installments of this have already appeared —the last in the July-June number, just come from the press. These enumerations are intended to be as complete as we can make them and to represent all the writings which have issued in the field of meteoritics since the beginning of the year 1932—general and popular as well as research and technical contributions. Heretofore, with a few exceptions, only publications bearing on meteorites proper have been cataloged in the bibliography; since, however, no essential difference exists between a meteor and a meteorite, the compilers have decided to incorporate in future lists, references to articles on meteors as well as on meteorites; hence, the "Bibliography of Meteoritics" will become a bibliography on both meteors and meteorites, and, it is hoped, will be of as much pertinency from the astronomic angle as from the geologic. Meteoritics, as I have remarked on a previous occasion, is a hybrid science; its chief contacts are, however, with astronomy (specifically meteoric astronomy) on the one hand, and with geology (particularly mineralogy and petrology) on the other. We trust that our bibliography will prove useful to investigators and other students of meteorites, irrespective of whether they are astronomers or geologists. Inasmuch as the bulk of the literature on meteorites is widely dispersed through diverse journals, a general integration of it, in the form of a comprehensive bibliography, has seemed exigent and a legitimate undertaking for the Society.

The President plans to appoint at this meeting a special committee of the Publications Board, to consist of Secretary H. H. Nininger and First Vice-President C. C. Wylie, whose duty shall be to keep up to date the catalog of all known meteoritic falls and finds and to publish serially, in our *Notes*, once or twice each year, extensions or additions to already existing catalogs. The Appendix to Secretary Nininger's *Our Stone-Pelted Planet* (Houghton Mifflin Co., 1933, pp. 143-232), with its twenty-one maps, is an inventory of all the recorded "Meteorites of the World by Countries," complete to January 1, 1932. This catalog should, periodically, be brought up to date in the Society's *Notes;* accordingly, with that end in view, the President is going to ask Secretary Nininger and Vice-President Wylie, as a special committee of the Publications Board, of which they are already members, to perform this valuable service for the Society and for the science of meteoritics.

Apropos of the catalog of meteorites, I should like to add that the Secretary's office, in coöperation with our Committee on Discovery, Identification, and Analysis, may fittingly act as an international "clearing house" for information pertaining to new meteoritic falls and finds, just as does the Harvard College Observatory (in the United States) for information relating to cometary discoveries, and

the Lick Observatory of the University of California, for material concerning new double stars.

I wish now to discuss a couple of suggestions for the work of the Society which have come from two of our members. I would take this occasion to say that such suggestions are always welcome, and that it is my hope that any member who has a suggestion for the welfare of the Society, will not hesitate to offer it at any time.

One member writes that, in his opinion, it would be a good thing to have regional representatives (members of the Society) who will pledge themselves—in so far as possible—to conduct searches for all possible meteorites, either falls or finds, which are reported in their localities. When a large meteor or bolide makes its appearance over an area, or when a meteorite is alleged to have fallen in a certain territory, the matter might be referred for immediate action to the Society's representative in that region, who could go, presumably at once, to the spot, and investigate. I need not dwell, before the members of this Society, many of whom are experienced students of meteorites, upon the imperative need for celerity in the recovery of specimens after their arrival on this planet. As I am heartily in accord with the foregoing suggestion concerning regional representatives, I am happy to endorse the idea and to transmit it at this meeting to the Society, with the recommendation that the members here present take under advisement the most effective way whereby such representatives may be appointed and put to work. The activities which I have just detailed obviously most closely relate to the interests of the Committee on Discovery, Identification, and Analysis, to which group particularly the matter should be referred, for that body's consideration and recommendation.

Another member asks: "Could not classes to further the study of meteorites be formed in different sections of the country? For instance, if there are four or five members living within a radius of twenty-five miles of New York City, could they not meet once a month at a local museum, such as the American Museum of Natural History, to exchange ideas and information, and to study and plan for some interesting objective together?"

This amounts to asking whether sectional meetings of members can be held, for the interchange of ideas and for mutual instruction. One of the functions of the Society, as stated in Article I, Section 2, of its Constitution, is "to advance the science of meteoritics and related sciences, through the increase and *diffusion of knowledge* concerning meteorites" (*Italics* mine). As to the feasibility, at the present time, of holding local meetings of members of the Society, I am not certain, although I am of course quite in sympathy with any proposal which is designed to promote the objects of our association in any way. I would recommend, in answer to the preceding inquiry, that members, who reside in the same community and who would like to meet at short intervals for mutual benefit and inspiration, form in their locality an unofficial "S.R.M. Club" and proceed to meet under its auspices. Such meetings could hardly fail to be helpful to all those participating in them, while at the same time they would not necessitate a formal organization or require any official action on the part of the Society as a whole. Another possibility—perhaps the easiest course for the President to pursue in the matter—would be to appoint a Committee on the Study of Meteorites and to refer the question to that committee for action! Since, however, our Society, like some universities, may have enough committees already, it would be probably inadvisable to increase the number without excellent reason!

Before I conclude these remarks I cannot refrain from saying that I feel that

one of the important purposes of our Society is to encourage the amateur and the layman in their observations of meteoric and meteoritic phenomena. Doubtless no other science is so dependent, for the accumulation of data, upon the testimony of laymen and untrained observers—nay, even chance beholders—as is the science of meteoritics. One cannot but be impressed by this fact after reading Secretary Nininger's article on "The Great Meteor of March 24, 1933," in the current June-July issue of POPULAR ASTRONOMY, nor can one fail to appreciate, after viewing the remarkable photographs of that spectacle, secured by Mr. Charles M. Brown and others, what a powerful scientific instrument even a common camera becomes in the hands of the layman who has both the intelligence and the presence of mind to use it effectively. As investigators of meteorites, we owe it to our science to encourage the efforts of all such persons, and, by the dual process of integration and interpretation, to make the utmost of the fragmentary and inaccurate but nevertheless valuable information which these lay observers furnish us—they, the eye-witnesses of rare cosmic events, the like of which we ourselves may not have seen, and may never, in the course of a lifetime, be so fortunate as to see.

Leonid Observations in Southern California*

By WALTER T. WHITNEY

At the Frank P. Brackett Observatory of Pomona College, Claremont, California, observations of the reappearance of the Leonid swarm of meteors have been made each November for four consecutive years (1930-33, inclusive).

A comparison of the results obtained from these observations suggests that the main body of the swarm may have already passed by without intersecting the earth's orbit centrally enough to produce a major display such as has been recorded for several previous encounters at thirty-three-year intervals.

The program for visual and photographic observations is discussed and some proposals regarding a spectrographic attack upon the general meteor problem also are made.

Radioactivity and the Age of Meteorites**

By ROBLEY D. EVANS†

The radium content of about one hundred specimens of meteoritic material has been determined by various workers. Radium is found in somewhat smaller quantities than in terrestrial rocks, and is least abundant in iron meteorites—most abundant in stony meteorites.

Seismological evidence shows the earth's central core and inner shells to be composed of material having the physical properties of meteoritic material. Assuming that the chemical properties also may be correlated, it is possible to compute the amount of heat generated within the earth by radioactive processes. There is thus disclosed a source of energy within the earth which is more than adequate to supply all the heat lost from the earth by conduction through its crust, as well as to supply the energy for all mountain-building processes, including earthquakes and volcanoes, to supply an excess of heat sufficient to cause convection currents in the substratum, as suggested by Holmes, and hence to provide the

*An abstract of a paper presented at the Second Annual Meeting of the Society.

**The abstract of an invitational lecture delivered at the Second Annual Meeting of the Society.

†National Research Fellow in Physics, University of California, Berkeley.

energy and mechanical requirements needed to make possible the gradual drift or motion of continents across the earth's surface.

Age measurements based on the helium-radium ratio in meteorites were made by Paneth, Urry, and Koeck, who found ages between 100 and 2800 million years for 22 specimens. Since these values are not clearly greater than the ages assigned to terrestrial rocks, it is concluded that the meteorite specimens tested were of the same age as the earth and hence had their origin in the solar system, not outside of it.

Apparatus is now being perfected with the aid of which it may be possible to determine the age of meteorite specimens by measuring the ratio of the uranium isotopes in the meteorite. Such a method has the advantage of avoiding errors due to loss of helium gas from the specimen. It is, however, very difficult from the experimental standpoint.

The Program of the Second Annual Meeting of the Society, held in Connection with the Ninety-Fourth Meeting of the A.A.A.S. (Section D), at the University of California, Berkeley, June 18 and 20, 1934

The President of the Society presided at all the sessions of the meeting, which convened in Room 1 of the Students' Observatory (the Berkeley Astronomical Department) of the University.

An asterisk (*) prefixed to the title of a paper or an address indicates that it was presented personally by the author. Contributions from absent members were read, at the request of the President, by the Secretary or by some other member in attendance at the meeting.

MONDAY MORNING SESSION, JUNE 18, 10:00 A.M.

*Welcoming Address by Dr. R. T. Crawford, Professor of Astronomy in the University of California.

Contributed Papers, etc.:

1. *Some Remarks concerning the Program of the Society for Research on Meteorites. Frederick C. Leonard, Department of Astronomy, University of California at Los Angeles, Los Angeles, California.
2. *A Description of the Meteorites Available for Public Inspection in the San Francisco Bay Region (Illustrated). Earle G. Linsley, Chabot Observatory, Oakland, California.
3. *The Surface Features of Meteorites (Illustrated). H. H. Nininger, Colorado Museum of Natural History, Denver, Colorado.

MONDAY AFTERNOON SESSION, JUNE 18, 2:00 P.M.

4. *Leonid Observations in Southern California (Illustrated). Walter T. Whitney, Frank P. Brackett Observatory, Pomona College, Claremont, California.
5. The Nature and Work of the Nininger Laboratory. Dean Gillespie, Denver, Colorado.
6. Bright Meteors of 1933 and 1934 (read by title only). C. C. Wylie, University of Iowa Observatory, Iowa City, Iowa.
7. *A Classification of Meteoritic Additions to the Earth. H. H. Nininger, Colorado Museum of Natural History, Denver, Colorado.
8. Report of the Committee on Questionnaires. Raymond E. Crilley (Chairman), Iowa Wesleyan College, Mount Pleasant, Iowa. (This report was read, in the absence of the chairman, by Walter T. Whitney, a member of the committee.)
9. *Report of the Committee on Terminology. H. H. Nininger (Chairman), Colorado Museum of Natural History, Denver, Colorado.

A short business meeting of the members of the Society and of the Council, present on the occasion, was held after the reading of the papers and the reports of this session.

WEDNESDAY MORNING SESSION, JUNE 20, 10:00 A.M.

10. The Great Alberta Meteor of March 18, 1934 (Illustrated). J. Hugh Pruett, University of Oregon, Eugene, Oregon.
11. The "Lazy Meteor" of April 17, 1934 (Illustrated). J. Hugh Pruett, University of Oregon, Eugene, Oregon.
12. Two Meteoritic Irons from New Mexico: The Grant Meteorite and the Santa Fe Meteorite. Edward P. Henderson, United States National Museum, Washington, D. C.
13. The Odessa Meteorite Crater (Illustrated). Oscar E. Monnig and Robert Brown, Fort Worth, Texas.

WEDNESDAY AFTERNOON SESSION, JUNE 20, 2:00 P.M.

14. *Radioactivity and the Age of Meteorites (Illustrated: a one-hour invitational lecture). Robley D. Evans, Department of Physics, University of California, Berkeley, California.

Adjournment.

Ample opportunity for discussion and questions was afforded at the conclusion of each feature of the program.

Secretary's Address: The Nininger Laboratory, 1955 Fairfax Street, Denver, Colorado.

Editors' Address: Department of Astronomy, University of California at Los Angeles.

Fireball Seen at Buffalo, N. Y.—On Sunday evening, July 1, at 10:10 P.M., Eastern Standard Time, a beautiful fireball was visible at Buffalo. Standing in my yard, facing east, I saw the flash of light around me and turned in time to see the latter part of the flight. The fireball could not have been less than twelve times as bright as Venus; the head was blue with a slight greenish tint. There was a dull red train, persisting for only about two seconds and red sparks were shooting out diagonally backwards from the head. I estimate the interval during which I viewed it, as 1½ seconds; then it disappeared with the suddenness of an occultation.

I first saw it just north of ζ Leonis. Its path was exactly along the line joining δ Leonis and 38 Cancri. The fireball disappeared at 38 Cancri.

JOHN E. MERRILL,
Curator of Astronomy.

Buffalo Museum of Science,
Humboldt Park, Buffalo, New York.

Notes from Amateurs

Amateur Telescope Makers of Chicago

The Amateur Telescope Makers of Chicago visited the Dearborn Observatory, on the Northwestern University campus on Sunday evening, June 10.

About forty of the members and their friends were there and Mr. Pierce took us in hand. He explained some of the work of the observatory on the spectra of red stars. Then we saw the meridian circle and the chronograph and Mr. Pierce explained their operation. The 18-inch Clark refractor was then pointed to Jupiter and everyone had a view of the great planet. Then we saw the great cluster in Hercules. No one who sees this cluster through this magnificent instrument will ever forget the sight. The beauty of it is unsurpassed and when realizing that he is looking at thousands of suns gathered together, sparkling and glinting like brilliant gems he is affected in two ways. He feels the insignificance of him-

self and his race but he also feels a pride in the scientific workers of his race who have made it possible for him to see and comprehend such a spectacle.

1319 West 78th Street, Chicago, Illinois. WM. CALLUM, *Secretary.*

Amateur Telescope Makers of Chicago

The monthly meeting of the Amateur Telescope Makers of Chicago was held at the home of the secretary on Sunday, July 1. The meeting was called to order at 2:30 P.M. by Professor Arthur Howe Carpenter, president of the club. The subject was "Future Activities of the Club," and the discussion was open. It has been felt that the club should undertake some definite program with the purpose of accomplishing results of value either in astronomy or instrument making.

Professor Carpenter gave an inspirational address in which he described some of the telescopes he has made and is making, including the 20½-inch which is being used nightly for the Arcturus ceremony at the Century of Progress Exposition. G. E. McCord suggested that an observing class would be very useful to beginners. He said that the member with a newly finished telescope would be greatly helped if he had some one to start him off by showing him how to use it and explaining some of the details in what he sees. In this way interest in observational work would be sustained and would continue to grow. Mr. Eliason has helped members in this way and continues to do so at every opportunity. Mr. Eliason suggested that we make a 20-inch reflector as a club project. The idea was received with enthusiasm by most of the members present. The question of a site for such an instrument was discussed and it was decided that if the instrument was completed a place to use it would be found without much trouble. A committee was appointed to handle the matter and the secretary was instructed to write for prices on a 20-inch blank.

The August meeting will be an observing party probably on the second Sunday in August. We will be the guests of Mr. Eliason at Winnetka. Those who attended the meeting last August will not miss this one. Members will be notified of the date and time as usual.

WM. CALLUM, *Secretary.*

1319 W. 78th Street, Chicago, Illinois.

Indianapolis Amateur Astronomers Association

Enthusiasm reached a new high in the activities of the Association during May due to its first anniversary. This was first displayed at the regular May meeting. There was no speaker so that the time could be devoted to a discussion of the future program. During this meeting President Samuel S. Waters gave the members a surprise with a complete report of the past year's activities and the present condition of the group. He began with the reminder that the purpose of the Association was "the furtherance of an interest in and the advancement and diffusion of astronomical knowledge among its members and the general public."

Among other things the President reported that there were 47 active members. Of these 25 had one or more telescopes ranging from 2-inch to 15-inch aperture. There were 10 mirrors and 5 complete telescopes finished during the year; 8 now under construction. There were upwards of 500 visitors privately instructed by the various members with their telescopes, as well as several groups, in the course of the year. From May, 1933, to May, 1934, three visits were made by members to the Indiana University Observatory, one to Dearborn, one to Yerkes, three to Cincinnati, and one to Mr. L. J. Wilson's at Franklin, Kentucky.

The Association is indebted to both professional and amateur groups of these various cities for having made these visits successful. It was further reported that the Association was now known throughout the nation, which the coöperation of the various scientific publishing houses makes possible.

The idea of erecting a large telescope in Indianapolis was brought up at this meeting as was that of issuing a monthly bulletin. A big outdoor observation party which was to be held on May 19 was also discussed. May 19 was an ideal evening for such a party. Other allied groups in the city coöperated to make it a big success. There were four of the largest and finest telescopes in the state, including a new 13-inch by Mr. Herman, set up at President Waters' new country home south of the city. The "seeing" continuously improved in quality and many took advantage of the clear skies until the "wee sma' hours." There were 200 in attendance at this party.

On May 26 a visit was made to the Illinois University Observatory at the invitation of Dr. Baker. A note of thanks is tendered him and Miss Modisett for having made this visit a success. Many new objects were observed as well as the recent disturbances on Jupiter. Some large Bloemfontein photographic plates were also scrutinized.

During the year the Association was host to several amateur as well as professional visitors, including Dr. Clyde Fisher of the American Mueum, and is looking forward to a year of greater activity.

Indianapolis, Indiana, June 2, 1934. V. E. MAIER, *Secretary.*

Amateur Astronomers of Pittsburgh

Increased telescope-making activity marked the first half of the year 1934 in the Pittsburgh section; at the present time there are more than fifty members making telescopes of apertures 4 to 12 inches, Newtonian and Cassegrain tpyes.

Two of the finest 6-inch reflectors in this vicinity have been completed recently in the Valley View shops; optical work by Scanlon, machining by Weisiger. The first is a Cassegrain f4-16 with all aluminum tube and mounting; the second is an all bakelite body tube and finder on a nickeled pipe mount. Also mounted at Valley View is the reecntly completed Cipul 12½-inch Pyrex Cassegrain reflector; mirrors aluminized by Clausing. With this instrument, utilizing a new idea in guiding eyepieces developed here, attempts will be made to secure photographs of clusters during the summer.

Schell of Beaver Falls is experimenting with another Cassegrain test for secondaries, utilizing the primary mirror instead of a second test mirror of half-radius according to Hindle. Also under test is a simplified and improved Herschelian telescope giving star images without the usual diffraction rays. Results secured will be published at a later date.

Mrs. Eugene S. Wiegel, ace sunspot observer and photographer in this group, completed her 6-inch reflector recently, and is utilizing this to guide her solar camera.

Telescope making invaded the cloister of the Benedictine Convent here; Sister M. Cornelia has just finished her first 6-inch Newtonian reflector and has started on a second, improved one. Sister Cornelia is Science Teacher in the Girls' High School conducted by the Convent.

Due to the size of the metropolitan district of Pittsburgh, embracing over 50 square miles, it has been found convenient to establish several focal points in outlying sections for the many amateurs there. One of the most active of these is the Westinghouse Club of Wilkinsburg, the Optical Division of which is under

the leadership of Fred C. Wilharm.

Through the courtesy of the Westinghouse Club's Optical Section, a combined meeting of their members with the Astronomical Section of the Academy of Science and Art was conducted in the club's quarters May 21. The feature of the evening aside from a fine display of amateur telescopes, microscopes and accessories, was the film "The Eyes of Science" showing the making of optical glass, prisms, lenses, and instrument.

Several of the members visited the Fels Planetarium in May, attending the A.A.V.S.O. convention there. They also enjoyed a visit to the Flower Observatory, Sproul Observatory, Haverford College Observatory, and the private observatory of Mr. Cook at Wynnewood.

Through the courtesy of Dr. Frank C. Jordan, Director of Allegheny Observatory, a special night has been reserved there for the Amateur Astronomers of Wheeling, West Virginia. The 13-inch refractor will be at their disposal under the supervision of Scanlon of Valley View.

At the last meeting of the Astronomical Section the following officers were re-elected: Warren A. Donaldson, President, Dr. B. L. Souther, Vice-President, and Leo J. Scanlon, Secretary-Treasurer. Mr. Sam S. Weisiger was appointed Chairman of the Program Committee with Fred M. Garland and Fred C. Wilharm assisting.

No indoor meetings will be held during July-August, trips to Ohio Wesleyan and Oglebay Park, Wheeling, being planned.

Leo J. Scanlon.

Valley View Observatory, Pittsburgh, Pennsylvania.

Astrolab Progress Report

The Traveling Telescope: One of Astrolab's 11-inch Polar Bowl Telescopes has traveled over a thousand miles in a five-passenger automobile during the past month and a half. To those who are accustomed to the usual long-focus bulky instrument this seems impossible, but the Polar Bowl belongs to the year of 1934 in that it is compact and semi-portable. It does not require an estate where it must be mounted permanently and never moved until its useful days are over. This 11-inch telescope made its first trip when the Joliet Astronomical Society invited our Morgan Park group to accompany them to the Yerkes Observatory at Williams Bay, Wisconsin. The Polar Bowl as an altazimuth was carried inside the car along with the six amateur astronomers from Morgan Park. This two hundred mile journey was made with such ease and comfort that when a meeting of the amateur astronomers of the eastern-central states was called by Leo J. Scanlon of Pittsburgh at Perkins Observatory, Delaware, Ohio, a distance of 300 miles from our home base, this telescope was again a part of Astrolab's display.

Variable Star Observing: As a result of its coöperative plan Astrolab is now equipped to coöperate more closely with its variable star observers. LTS, Astrolab member in Portugal, has recently sent in 86 charts on vellum, copies of the charts he receives as a member of the A.F.O.E.V. The tracings are beautifully done and should make excellent blue prints.

The Perseids Meteor Shower in August should be unusually good as there will be no moon to interfere. Astrolab will coöperate with various observing groups.

L. I. Buttles.

10728 S. Artesian Avenue, Morgan Park, Chicago.

Zodiacal Light Notes

By FRANKLIN W. SMITH

The Zodiacal Light is in its least favorable position for observation from stations in the northern hemisphere at this time of the year. It was last seen here on June 2. On that evening (at 9:20 E.S.T.) the apparent apex was near η Leonis; the southern edge passed near δ Cancri and the northern edge between ξ Cancri and λ Leonis. The axis of the light cone therefore appeared to be about 4° north of the ecliptic, and the elongation of the apparent apex from the sun was about 80°.

Some observers have expressed the opinion that the change in the geometrical conditions of visibility of the Zodiacal Light is not sufficient to explain its gradual disappearance during the latter part of May and June (as seen from northern stations), and that some other cause must be operating to produce this effect. A more detailed examination of the geometrical conditions shows that the observed phenomenon may be readily explained on the basis of these alone. At the end of twilight on the evening of March 21, a point on the axis of the light cone (assumed to lie in the ecliptic) and just on the horizon as seen from a station at latitude 40° north, will have an elongation from the sun of about 20°. A point similarly located on the axis of the cone and on the horizon at the end of twilight on June 21 will have an elongation of about 37°. Thus we find that not only is the altitude of that portion of the light cone which is above the horizon low in June because of the small angle between the horizon and ecliptic at that time, but the innermost and brightest portion of the cone which was conspicuous in March at the end of twilight is actually below the horizon at that time in June.

407 Scott Avenue, Glenolden, Pennsylvania, July 3, 1934.

Asteroid Notes

By HUGH S. RICE

Various asteroids are always available for telescopic observation; it is believed, however, that not much attention is commonly given to these objects by users of small telescopes.

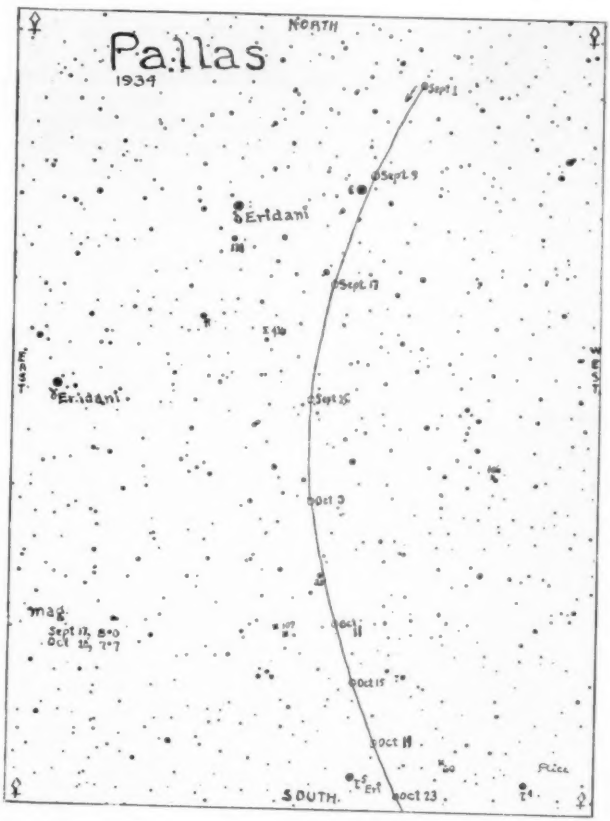
Excellent success has been attained by the writer in finding and observing certain asteroids from his own diagrams. *Vesta,* the easiest of the minor planets to see, is now finishing a long period of visibility, during which it was observed on 30 nights, from April 5 to June 19. In its apparent path among the stars it traveled in a wide curve south of the bright star β Leonis; when near this star it was not difficult to establish an absolute minimum time for picking up a planetoid, so that at certain times, for the first observation of the evening it was located *instantly* upon placing one's eyes at the oculars of the Zeiss binoculars magnifying eighteen times, the glass having been first lined up with the key star by sighting along the top of the instrument.

We observed *Vesta* also with a 5-inch Brashear telescope during this opposition period. It was definitely seen to exhibit a pinkish or reddish color, and we noted the same color in the spring of 1930. It appears that this color was seen many years ago by certain German observers.

The best asteroid for small telescopes during June and July was *Hebe* (6). It was traversing an interesting region of the Milky Way, near the shield of

Scutum. Six observations were made by the writer, after it had gone into Serpens. Magnitude was about 8.5. In this general region we saw Messier 11, a magnificent cluster of small stars, the variable R Scuti nearby, and the nebula H. I. 47, and others.

A whole magnitude fainter than *Hebe* just now is *Hygiea* (10), coming to opposition August 20. It is probably the most suitable asteroid to observe during August. It needs a 3-inch glass, and a diagram; such a diagram is shown in the "Handbook of the Heavens," published at this institution. *Hygiea's* path lies a few degrees north of Saturn's, and parallel to it. On the evening of September 7 it will be less than one-half of a degree northwest of the star 46 Capricorni.



Pallas (2), one of the principal asteroids, will be observable in September and October; its exact location can be obtained from the accompanying chart. The dates along the curve give positions for 6:00 P.M., C.S.T., on the dates indicated. Ephemerides of the *British Astronomical Association* were used. *Pallas* will be seen to take a southward course in Eridanus, passing to the west and within a few

minutes of arc of ϵ Eridani on September 10. It will come closer yet to 20 Eridani on October 8. (Similarly, the track of *Vesta* in 1933 showed that on October 23, at 0^h, G.C.T., this planet was to be immersed in Messier 95 in Leo, and on the following day to pass just south of M 96, a "very bright" nebula [Webb], but clouds prevented observations here.) For *Pallas*, first locate δ Eridani, 23° west of Rigel; then move the telescope over to the asteroid track, identifying the stars. The magnitude of *Pallas*, 8.0, near the first of September, improves to a maximum of 7.6 in November. Nebulae H.I. 107 and 60, shown on the chart, lie a short distance away from the path of *Pallas* in October.

American Museum of Natural History, New York City.
July 25, 1934.

Communications and Comments

Under this heading we shall publish from time to time such material as does not properly fall under any of the established headings of this journal. Here, too, may be found, when occasion arises, articles which the editors may not be willing to give sanction to but which, nevertheless, may be provocative of thought along new lines.

Centrifugal Force and the Tides

It seems to me that centrifugal force does not receive the consideration it merits at the hands of those who analyze celestial mechanics.

Centrifugal force is acknowledged to be the force which opposes and balances gravitation, keeping heavenly bodies in their courses. It is an induced force. Whenever a body in its forward motion is compelled, by any means, to move in a curved path, there will be centrifugal force exerted in the direction of the radius of the curve and away from its center.

Centrifugal force is recognized as the force that compels the earth to assume the shape of an oblate spheroid because of its rotation on its axis. However, there is another rotating or revolving motion of the earth, the influence of which I do not think astronomers have appreciated or worked out. I refer to the monthly revolution which the earth makes around center of mass of earth and moon, a point (or an axis) about 1050 miles below the surface of the earth, located on (or intersecting) the radius vector of the moon. There is a flattening effect in this motion that does not seem to have received consideration. Further, there are disturbing influences due to this eccentric throw that are more potential and significant than the effect of the mere flattening at the poles.

These disturbing influences exhibit themselves in several ways. First, there are the tides, then there are internal heat in the earth, volcanoes, earthquakes, and finally the wobbling of the earth's axis of rotation detected in recent years by changes in the measured latitude of stars and irregularities in the transits of stars.

The universal explanation of tidal action, in my judgment, is not satisfying and is deficient, since it does not consider all of the forces in the case, and since mechanically the tide itself is out of agreement with the forces that are supposed to keep it going.

As a sample of the common explanation of tidal action take the analysis in Young's Astronomy. In that analysis Young shows very clearly, in treating the influence of the sun on the earth and moon, as these bodies revolve about one another, that the sun's influence is to cause earth and moon to approach one another

at quadrature and to recede from one another at syzygy. This is quite correct, of course. He then applies this same analysis to a particle on the surface of the earth in its circular path, as the earth rotates on its axis. He finds a separating force when the moon is overhead, and this is the tidal force.

In the case of the disturbing force between moon and earth the premise is correct, for it deals with bodies free to move and moving in accordance with the law of freely moving bodies. In the case of the particle on the surface of the earth the premise is wrong, because that particle is not free to move and is in fact moving only at about one-twentieth of the velocity it would acquire if it were revolving about the earth in a circle of 4000 miles radius. The particle is part of the earth, and as such is held in its relative position to the earth with all the rigidity that body possesses.

It is conceded that if the earth were stationary with respect to the moon's radius vector (the same side of the earth always facing the moon), there would be a permanent tide, so the particle on the earth's surface need not even be in motion at all with respect to the moon. Surely a premise that in such case would treat a particle on a stationary sphere with the same analysis as a body freely moving in space can make no claim to correctness.

Young also further explains tidal action in the well-known manner by showing that the near superficial particle (on the earth's surface) is drawn to the moon with greater force than the far superficial particle. The difference between these forces being the tide raising force.

With a false premise it is not expected that a correct solution can be reached to the problem. The latter solution, however, has the further error in that it endeavors to find the differential force on particles (of the same mass) on opposite sides of the earth's surface, whereas the differential force of value in such tide determinations (only differential forces considered) is between intercepted volumes, of corresponding layers, intercepted by cones of gravitational influence, just as in Newton's proof that the center of "gravitation" of a sphere is at its center. When these volumes are substituted for the particles, there is found to be exactly the same gravitation for each of them, and the tidal force, by this method, vanishes, since there is no separating force.

The fact is that consideration merely of differential forces on a particle does not constitute complete analysis. It is essential that all forces acting on a particle be considered. This the standard analysis of tidal action fails to do.

The actual tides do not prove the tidal theory, for the reason that in ports on the open sea the tide is always high when the theory would predict low tide and *vice versa*. Friction, holding back the tidal wave until hours after the alleged tidal force is completely reversed, is no explanation of this discrepancy. Two facts preclude this explanation of lag in the tides. One of the facts is that at no point in the theory is the origin of the wave accounted for; the other is that the natural velocity of an ocean wave, however great the wave, is only a fractoin of that of the known velocity of the tide. This latter means that the tide must be driven every mile of its course.

It will be urged that on the basis of the accepted tidal theory the time and height of tides are predicted with accuracy and confidence. This is not the case. The only way the tides of any port can be predicted, as all writers on this subject concede, is by recording the same for a year or more. Then any theory that recognizes that the moon is the prime cause, the sun a secondary, and that the tidal height varies in some inverse ratio to the distances of these bodies, can be used to work up a tidal table.

The earth is not composed of particles free to move in response to the gravitation of the moon. Hence an analysis on that basis will tell nothing of the relative motion of those particles, because of the fact that the only relative motion between particles composing the earth that can take place must be by the slow process of fluid flow or the much slower process of distortion due to stress or strain. The fluid flow can effect only the film on the earth's surface called the oceans, but the stress or strain will effect practically the entire body of the earth.

Because of the exceedingly slow change in relative position of particles in the body of the earth, as compared to free response to gravitational accelerations, the forces and their influence are virtually a problem in statics. The problem of the oblateness of the earth at the poles, due to its rotation, is solved by considering gravitation of the equatorial bulge, and centrifugal force as static forces. The same sort of analysis, considering forces as static, will solve the problem of tidal action; and this solution finds a tide that is in complete harmony with the actual tide.

The several forces on the particles composing the earth are these:

Gravity of the earth for each particle.
Gravitation of the moon for each particle.
Centrifugal force, due to the monthly swing around center of mass of moon and earth, on each particle.

The earth's gravity may be neglected in considering particles on opposite sides of the earth's center or corresponding points on opposite sides of a plane of symmetry, as the forces balance.

The problem then is resolved into one of finding the resultant of gravitation of the moon and centrifugal force on all particles in the body of the earth, and from the nature of these forces the change of shape in that body may be computed or judged.

In the figure the earth is shown in two sectional views. At (a) the section is through the moon's radius vector in the plane of the moon's orbit. At (b) the section is normal to the moon's orbit.

For simplicity of figures in this discussion the center of mass of earth and moon is taken at ¼ of the earth's radius below the surface. Other features of this figure will be explained presently.

At the center of the earth the intensity of gravitation of the moon (called G) on a particle is exactly equal to that of centrifugal force (called C. F.), but these forces are in opposite directions.

For the present part of the discussion only, gravitation of the moon is considered uniform on the whole body of the earth and parallel to the radius vector. Later the influence of its variation will be discussed.

Centrifugal force, for a given rate of revolution, varies on any particle directly as the distance from the center of revolution. On the particles A and D the centrifugal force is 7/3 G acting to the left. But gravitation acts to the right with a force of G, making the resultant force on those particles 4/3 G. On B and E the centrifugal force is 1/3 G to the right, and gravitation is G, also to the right, making the resultant force on those particles 4/3 G to the right.

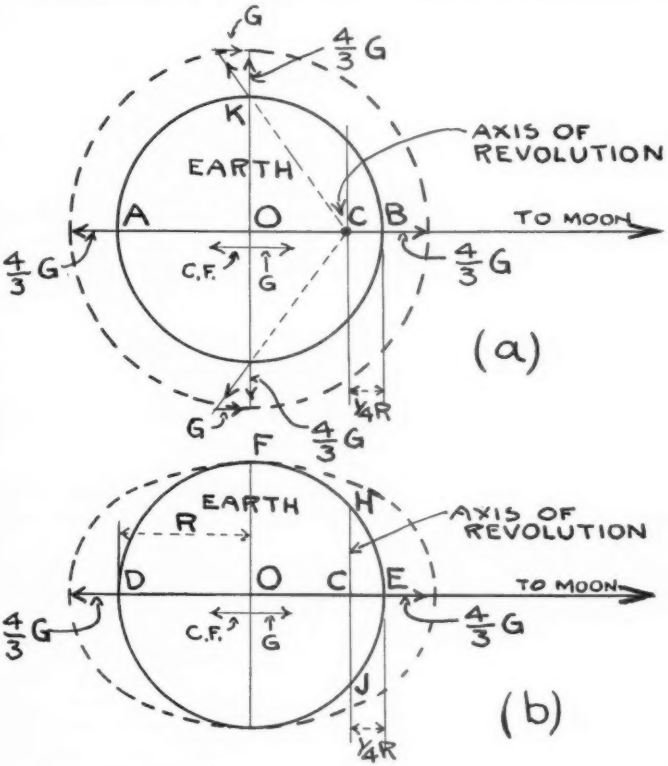
On the particle K centrifugal force is in the direction CK, as indicated. Computation will show that the resultant force is directly outward from O and is also 4/3 G.

At F there is exact balance between centrifugal force and gravitation.

On the assumption, then, of uniform gravitation on all particles of the earth the effect would be to flatten the earth at the ends of the axis normal to the

moon's orbit and enlarge every section normal to this axis without distorting its circular shape.

But, of course, the gravitation of the moon is not a force uniformly exerted on all particles of the earth. On every particle of the near hemisphere (not merely on the superficial particles, as considered by Young in the analysis cited) the moon is pulling with greater force than it is pulling on the symmetrically located particles of the far hemisphere. This means, as anyone may compute, that the resultant force at A and D is greater than 4/3 G and the resultant force at B and E is also greater than 4/3 G, whereas the resultant at K is just a trifle less.



This means that the diameter AB of the earth is elongated, not merely that the superficial film of water, the oceans, are lifted, as reasoned in the standard analysis, but the whole earth itself heaves. There is no reason why the water should be lifted higher than the body of the earth itself. In fact, the heaving body of the earth itself is a perfect and consistent explanation of the existence of the ocean waves on the sides of the earth rather than under the moon and the opposite side.

High tide means low earth level and *vice versa*. The tide is pushed around the earth in the trough, so to speak, of the heaving body. Depress a continent at

its shore, and the ocean will rise in comparison. Send a depression around the circle of the earth's body, and a wave will follow this depression.

The force which distorts the earth, while it is small on any particle, is gigantic when considered as a whole. It amounts to the entire difference between the gravitation of the moon for the near hemisphere and the far hemisphere. While this may seem to be the same force arrived at by the standard theory of tides it is arrived at by an entirely different process. The influence is on the body of the earth itself and not merely on the oceans. The action takes place at the time the forces are being exerted and not seven or eight hours later, when forces are reversed. The ocean wave is a mere index and not the primary action.

This continual heaving and change of shape in the body of the earth is ample explanation of the inexhaustible supply of internal heat, the very frequent tremors and earthquakes, and volcanoes.

Furthermore this heaving of the earth's surface accounts for variation in the measured latitudes of stars, which have recently been observed to have a direct connection with the moon's phases. Also discrepancies of a tenth of a second in transits of stars, reported recently between London and Washington are explained by the same facts.

The wobbling of the earth's axis involves still another neglected field of celestial mechanics. I refer to the shift of the center of "gravitation" of a body not spherical. By center of gravitation is meant the point at which a body may be considered as concentrated and still give the influence of the entire body. By reason of the variation of gravitation, as distinguished from gravity, (a force sensibly constant on the earth's surface), only a perfect sphere has its center of gravitation at its geometric center. The center of gravitation of the earth, an oblate spheroid, is closer to the moon than its geometric center or its center of mass. The center of mass is the center of rotation, but the center of gravitation rotates about the center of mass. Without taking up the space to go into this phase of the problem it is merely suggested here that consideration of the facts just stated offers an explanation of the wobble in the earth's axis of rotation.

Considering the body of the earth as a sphere of equal density throughout, I compute the bulge at the equator, due to the revolution around the center of mass of moon and earth, to be about 50 feet. It is significant that the wobble, to which reference has been made in this paper, of the earth's axis, has been estimated at about half of this.

EDWARD GODFREY.

Professional Building, Pittsburgh, Pennsylvania.

Is the Universe Blowing Up?

Apparently the universe *is* blowing up. The fact that the distant nebulae seem, from their Doppler shift, to be receding at speeds increasing approximately in proportion to their distance, even up to 15,000 miles per second, strongly suggests such a theory. Yet there is a growing suspicion that the shift toward the red in these instances is due, at least in part, to other causes than motion in the line of sight.

Among the alternative explanations are the following:

(1) that it is due to obstructing matter in space;

(2) that the light is slowed down by gravitational pull;

(3) that it is due to some principles of relativity,—especially those laid down by De Sitter, namely, that the shift is partly owing to mere distance, and partly owing to an inherent tendency of the nebulae to scatter.

The last of these theories would seem to be shipwrecked by the group of three nebulae in Coma whose apparent velocities of recession are 2280, 4380, and 4680 miles per second, respectively. Jeans ("The Universe Around Us," p. 82) considers that De Sitter's theory requires a more uniform increase of speed. In other words, it cannot account for such variations of speed in objects so nearly at the same distance from us (namely, about 50,000,000 light years).

Were either the gravitational or the obstruction theory true, the Doppler shift should decrease, in some approximate proportion, from the galactic plane to the galactic poles. This does not seem to be the case.

Moreover, neither gravitational pull nor obstructing matter would be evenly distributed through space. Hence, if either were the cause of the Doppler shift, the increases in the shift would be decidedly more spotted than they are. In other words, the increases in the shifts would be far from uniformly proportional to the distances of the nebulae.

And, lastly, the evidence at hand seems to show too small an amount of obstructing matter in space to account for the shifts. "At least in the direction of the Coma-Virgo groups intergalactic space is effectively transparent." (Baker's Astronomy, p. 502.)

The true explanation would seem to be the simplest,—namely, that either through inherent loss of energy or through an infinitesimal friction of the ether the light-waves or photons gradually slow down.

> (NOTE: It has been assumed by some that there is no ether, and by others that if there is an ether it must be frictionless. But neither of these assumptions has been proved. If light be waves, it must be waves of some substance, and if not waves of ether then waves of what? And any substance must be subject to at least an infinitesimal friction. Besides, what can matter itself be except waves? For, since no solid particle can be subdivided indefinitely, matter in its ultimate form must consist of a homogenous substance capable of vibration. That a slowing down of waves means a lengthening of waves is suggested by the fact that distant thunder is always of low pitch.)

This theory of the slowing down of the photons would seem to fit all the known facts.

(1) It harmonizes with the contrasts in the speeds of the three nebulae in Coma. Assuming that an apparent speed of 3400 miles per second (the average of the lowest and the highest speeds of the three) is due to the slowing down of the photons we have an approach speed of 1200 miles per scond for the first nebula and recession speeds for the others of 900 and 1200 miles per second, respectively. These velocities are well within the range of plausibility.

(2) This theory also explains the slight Doppler shift toward the red in the more distant stars of our own galaxy,—well within distances at which blue stars retain their color unimpaired.

(3) It would also seem to explain why the prevailing star-types of the nebulae are F, G, and K, by suggesting that they are really O, B, and A types whose light has been slowed down, the light of the cooler types having been too much slowed to register.

By assuming that the average increase in the Doppler shift among the distant nebulae is due to a slowing down of their photons, we shall undoubtedly disclose some very interesting facts about the movements of our kindred galaxies, and shall prove that, after all, they are not taking French leave and the universe is not blowing up.

HERBERT POWELL LEE.

927 S.E. Pine Street, Portland, Oregon.

Lunar Rays

The curious light-colored streaks or rays which radiate from Tycho and to a lesser extent from Copernicus, Kepler, Aristarchus, Anaxagoras, and others, have always puzzled the astronomer.

One of the most noticeable features of the full moon, they have been ascribed to cracks in the surface filled with a glassy volcanic rock or snow having a more brilliant reflecting surface than the surrounding disc, or to a staining of the surface by gases ascending through these rifts.

These remarkable rays extend for great distances. They are fairly straight and cross valley, crater, and mountain without much variation in color or width. However, they are certainly a surface marking.

If they are cracks why do they follow great circles in their general arrangement? We do not find any such law governing the formation of rifts on the earth.

The average width of the rays may be said to be a little over five miles. Is it not hard to imagine an outpouring of gas capable of staining the surface to a uniform width while crossing all manner of broken and violently mountainous formations?

In the case of Tycho the rays do not radiate from the center of the crater but from a point a little to the east. If they were cracks caused by a violent fracture of the surface one would expect them to center directly in Tycho.

Does it not seem more probable that these markings are the result of material falling from above? Their telescopic appearance would certainly seem to substantiate this conclusion. They look as if they had been "splashed" down on the surface of the moon. These are superficial markings without a doubt and the result of violent volcanic action at a late date in the satellite's history.

The process might be likened to the bursting of a bomb or colored light ball in a fireworks display. These throw out lines of flaming material, which if enclosing a globe, would fall in great circle streaks all around it. The same thing might well have happened in the case of the moon. A terrific explosion liberated a great quantity of material which flew out in all directions from the central crater. As there was no atmosphere to disturb its distribution it fell in lines radiating from the vent. Being rather light and owing to the small gravitational effect of the moon it was distributed over an immense area.

The rays are not always of exactly the same color as might be expected due to the difference of the material of which they are composed. Around some of the craters the "splashing" effect is very noticeable.

The fact that they are so much more prominent during full moon can be explained in several ways. It is apparent that many other lunar features are also more noticeable at this time due to their position with regard to the angle of illumination.

It might also be due to a crystalline structure which reflects sunlight better in one position than in another.

In a few cases the rays are actually depressed below the surrounding surface for part of their length. This could well be an area where by accident the decending substance fell in an already formed depression or where later a subsidence took place.

Taken altogether the Explosion Theory of Lunar Rays would seem to account for observed conditions in a more logical manner than other explanations advanced in the past.

Don H. Johnston.

Euclid Beach Park, Cleveland, Ohio, June 25, 1934.

General Notes

A new feature is introduced on page 406 of this issue, namely, Asteroid Notes. This phase of astronomy has been somewhat neglected in this magazine up to this time. Now through the generous coöperation of Mr. Hugh S. Rice of New York City, we are able to present interesting items relating to the asteroids and helps for observing them from month to month. This will afford a fascinating diversion for amateurs who have small telescopes at their disposal.—Ed.

Dr. Alfred Fowler, Yarrow research professor of the Royal Society and professor of astrophysics at the University of London, on May 1 was granted the doctorate of science by the University of Cambridge. (*Science*, May 25, 1934.)

Dr. Otto Struve, director of the Yerkes Observatory and of the McDonald Observatory, recently gave a lecture at the University of Texas entitled "Some of the Work that is being done with large Telescopes." (*Science*, May 25, 1934.)

Felix Aguilar, formerly a member of the staff of the La Plata Observatory, became the director of that observatory on May 15 of this year, as successor to Professor J. Hartmann, director since 1922, who retired on account of failing health.

Goodwin Deloss Swezey, professor emeritus of astronomy in the University of Nebraska, died on July 10 at the age of eighty-three. We intend to publish a biographical sketch of Professor Swezey and a summary of his work in a subsequent issue.

Lick Observatory Fellowships.—Fellowships at the Lick Observatory, for the year beginning July 1, 1934, have recently been announced as follows: Dr. Gerrit P. Kuiper, Alexander Morrison Fellow; Dr. Arthur B. Wyse, Martin Kellogg Fellow; Mr. E. H. Cherrington, Lick Observatory Fellow; Miss Elizabeth H. Gillespie, Lick Observatory Fellow.

Griffith Observatory and Hall of Science.—The corner stone laying ceremony of the Griffith Observatory and Hall of Science, in Griffith Park, Los Angeles, California, was held on the afternoon of July 12, 1934. The speakers on the occasion were Mrs. Mabel V. Socha, President, Park Commission City of Los Angeles; Hon. Frank L. Shaw, Mayor, City of Los Angeles; Col. C. W. Huntington, representing Hon. Frank F. Merriam, Governor, State of California; Dr. Robert A. Millikan, Chairman, Executive Council, California Institute of Technology; and Dr. Frederick C. Leonard, Chairman, Department of Astronomy, University of California at Los Angeles. The Griffith Observatory and Hall of Science will contain the third planetarium to be completed in the United States.

Amateur Astronomer.—The summer number for this year of this publication has just been received. It is the usual sixteen-page edition. The front cover is an interesting composite of many astronomical suggestions. From this number we learn that ground was broken for the planetarium building at the American Museum of Natural History on May 28, the first earth being turned by Mr.

Charles Hayden, the donor of the instruments for this new institution. A number of longer articles are to be found also, among them some pointed quotations from an address by Sir Arthur Eddington, on the occasion of a luncheon given in his honor by the English-Speaking Union in New York City on April 28. The Amateur Astronomer Association is to be commended for initiating this publication.

The Nantucket Maria Mitchell Association.—The thirty-second annual report of this association has recently been issued in a thirty-page pamphlet. Although the person for whom the association is named was interested primarily in astronomy, there is also a natural science department as an essential part of the association. The report contains two photographs beautifully reproduced, one of the Orion region of the sky, the other a wild flower display arranged by the natural science department. Miss Margaret Harwood is the Director of the observatory of this association.

Astronomical Discourse is the name of the official publication of the Missouri-Southern Illinois observers. Numbers 6 and 7 of Volume I have recently been received at the office of POPULAR ASTRONOMY. Each number consists of three large sized mimeographed sheets filled with interesting reading. It bespeaks great enthusiasm on the part of the editor, Mr. J. Wesley Simpson, and much interest on the part of the supporting observers in that section.

Texas Observers' Bulletin, No. 33.—This is the issue of this publication for May, 1934. It consists of three mimeographed sheets which contain short items of various timely astronomical phenomena and events. Accompanying the mimeographed sheets is a beautiful 9 by 14-inch multilith reproduction of an imaginary scene on the moon "Looking South from Gassendi," from copy originally made by Russell W. Porter and published in POPULAR ASTRONOMY for August-September, 1916.

The Sky Travelog is the title of a large single sheet sent out recently by Henry Dill Benner of New York. The sheet contains a number of miscellaneous astronomical facts somewhat fancifully related. Mr. Benner promises similar *Travelogs* in the future if a sufficient number of dimes are forthcoming.

Lines in Sunspot Spectra.—Recently has been made in Italy the very strange statement that the discovery of the widening lines in sunspot spectra was made by Professor L. Respighi at the Observatory of the Capitol in Rome, in the year 1870. In the *Memorie della Societi Astronomica Italiana,* Vol. VI (1932), pp. 141-157, Professor Pio Emanuelli shows that this statement is entirely erroneous. The discovery of the widening of the lines in sunspot spectra was made by Sir N. Lockyer in the year 1866; the phenomenon was then seen in 1869 by Secchi, and then by Young and Respighi in 1870.

Professor P. Emanuelli stated that it is also erroneous to affirm that Professor Respighi anticipated Professor Hale's discovery of the magnetic field in the sunspots, and that it is doubtful that the widening observed between 1866-1872 can be due to the Zeeman effect.

The Instituto di Studi Romani has published a historical paper by Professor Pio Emanuelli on the *Astronomia in Roma.* (Rome, 1933, pp. 32, with 8 plates.) The author explains in its principal points the History of Astronomy in Rome,

dividing it into three periods: 1. from the ancient and medieval time up to the Renaissance; 2. from the Renaissance to the foundation of the Observatories of the Roman College and the Campidoglio at the end of the eighteenth century and at the beginning of the nineteenth; 3. from that time to the present time.

Professor Emanuelli speaks of the calendar reform in 1582, of Galileo's Trial in 1633, of the School of Astronomy at the Roman College at the time of Clavio, of the works of Scheiner, Bianchini, Secchi, Millosevich and other Roman astronomers.

American Astronomical Society.—The fifty-second meeting of the American Astronomical Society will be held at Connecticut College, New London, Connecticut, September 10-12, 1934, on the invitation of Professor G. K. Daghlian.

The tentative program is as follows:

Monday, September 10, 11:00 A.M., Council Meeting; 2:00 P.M., Session for Papers.

Tuesday, September 11, 9:00 A.M., Council Meeting; 9:30 A.M., Session for Papers; 2:00 P.M., Business Meeting.

Wednesday, September 12, 9:30 A.M., Session for Papers.

The customary special dinner will probably take the form of a picnic supper on Tuesday evening. Members may make use of the college tennis courts, and swimming at Ocean Beach is suggested.

Those desiring dormitory rooms and meals at the college should make their reservations with Professor Daghlian. The charge will be three dollars a day. Members who have acted as hosts know, and others can readily imagine, how much an early and accurate statement of accommodations desired will be appreciated. It is particularly important to know who will be present for luncheon on Monday. Recommended hotels are the Mohican Hotel and the Crocker House.

The frequent trains on the N. Y., N. H. & H. R. R., via Shore Line, make stops at New London. Perhaps the Vermont Central should be mentioned also. It runs through Amherst and a few other places. The New London boat leaves New York daily at 11:00 A.M., arriving in time for supper. A bus line runs from near the railroad station to the college.

Titles of papers should be sent in by July 31. There are numerous advantages in sending in abstracts, in form for publication, before the meeting.

RAYMOND S. DUGAN, *Secretary.*

Princeton University Observatory, Princeton, New Jersey, June 1, 1934.

Reminiscences

I. On the night of May 12, 1876 (*remember 1876*), Dr. Leonard Waldo, assistant at the Harvard College Observatory, was observing doublt stars with a filar micrometer attached to the 15-inch equatorial telescope. I recorded the observations for him. After making several settings, Dr. Waldo went downstairs to the library for a book. In about ten minutes he returned to the dome, greatly excited. He said, "Seagrave, I want you to come right down to the library and see what is going to be one of the greatest inventions of the nineteenth century." I went down to the library with him, and there was Professor William A. Rogers, assistant and in charge of the meridian circle, talking through what appeared to me to be a box. He would talk, then put the box to his ear to listen, then talk, and then listen again. Dr. Waldo said to me, "Do you know to whom he is talking and listening?" I said "No." Waldo said, "He is talking to a party in Boston five miles away." I became greatly interested right away. I talked and

listened myself as soon as Professor Rogers had finished, and I found that I had been talking to Professor A. Graham Bell, inventor of the telephone. He was then experimenting between his Boston laboratory and several places a few miles away.

The next day I went to Providence where I then lived. I told many people what I had seen and heard on the previous night. My parents were then living. They all laughed and ridiculed the idea of talking to a party five miles away through a box. They all said I had been talking to somebody in the next room or downstairs. The afternoon that I arrived in Providence I went into Tibbetts and Randall's bookstore on Westminster Street. I was well acquainted with both gentlemen, as I had bought many books there. I told them of my experience on the previous evening. They both, and every customer who came in, ridiculed and made fun of me. To cap the climax, both Tibbetts and Randall went to my father and insisted upon it that I be sent away for observation,—the idea of talking such nonsense.

All of this happened in May, 1876. I was only 16 years old then. I am now 74. This is not wholly astronomical. Bell lectured in Providence the following September to a crowded house.

II. On the night of August 16, 1877, I was one of a party of seven people who were up in the dome of the 15-inch equatorial telescope of the Harvard College Observatory. We were all greatly interested in observing the then newly discovered satellites of Mars, made three days earlier by Professor Asaph Hall, then of the U. S. Naval Observatory at Washington. The seven who were there included Professors E. C. Pickering, William A. Rogers, Arthur Searle, Leonard Waldo, Winslow Upton, George B. Clark of the firm of Alvan Clark & Sons, and myself. After we had all seen the satellites, a photometer was placed at the eye-end of the telescope, and Professor Pickering started a series of photometric measures of the brightness of the satellites. Just before midnight, the photometer was taken off and a filar micrometer put on. Dr. Waldo made many measures of positions and distances of the satellites, and did not finish until dawn of August 17. I recorded the observations for him.

I am writing this as I am the only one living of the seven up in that dome that night. The other six have passed on.

FRANK E. SEAGRAVE.

8 Durham Street, Boston, Massachusetts, June 25, 1934.

Errata.—Mr. Wen Shion Tsu has called attention to several errors in his paper which appeared in the April issue of POPULAR ASTRONOMY for this year. The corrections are as follows:

p. 195, Art. 9, line 3, "Year" should be "Yeou."
p. 195, Art. 10, line 5, "S. V." should be "ξ, ν,".
p. 195, Art. 10, line 6, "B and N" should be "β and η."
p. 197, Art. 15, line 5, "5 Sagittarii" should be "Sagittarii."
p. 199, Art. 21, line 7, "x Ursae Majoris" should be "χ Ursae Majoris."

Book Reviews

Handbuch der Astrophysik, Vol. V, Second half. Edited by G. Eberhard, A. Kohlschütter, H. Ludendorff. (Julius Springer, Publisher, Berlin, Germany. 96 marks; bound 99 marks.)

The first half of this volume of this monumental work was described in the

February issue of this magazine (page 116). These two parts of volume V and volume VI, which appeared in 1928, are devoted to an exhaustive consideration of the system of stars. In particular, the second half of volume V, which has recently been received, contains the continuation of the discussion by Professor Knut Lundmark, which was begun in the first half, on the Luminosities, Colors, Diameters, Densities, Masses of the Stars. This is followed by a discussion, sixty pages in length, of Stellar Clusters, by Professor Harlow Shapley. This, in turn, is followed by 158 pages on the Nebulae by Professor Heber D. Curtis. And finally there follow 132 pages on the Milky Way by Professor B. Lindblad. These papers, especially the one by Professor Curtis, are well illustrated with photographs and diagrams. In appendices, one finds interesting and useful catalogues of globular clusters, galactic clusters, stars brighter than $5^{M}.00$, and stellar diameters.

The reviewer does not claim to have read this volume throughout. It would be a large, but certainly very interesting and profitable task to read it. The contemplation of such an undertaking impresses one with the stupendous amount of labor involved in the writing of it. The reviewer, however, has read enough here and there to have received a very definite concept of the breadth and depth of these surveys. Certainly there is no other source to which one might turn with the same assurance that he is dealing with authentic and comprehensive material.

Concurrently with the part just described, volume I of this series has appeared. It, as would be expected, appropriately deals with the foundations of astrophysics. The several chapters bear headings as follows: Chapter 1, Foundations of theoretical optics, by Professor H. Schulz, Berlin. Chapter 2, The telescope, by Dr. Albert König, Jena. Chapter 3, Spectroscopy, by Dr. C. Runge, Gottingen, and Dr. K. W. Meissner, Frankfurt A.M. Chapter 4, Stellar spectrography and the determination of radial velocities, by Dr. G. Eberhard, Potsdam. Chapter 5, Apparatus and method for measuring the total radiation of the heavenly bodies, by Dr. W. E. Bernheimer, Vienna. Chapter 6, The reduction of celestial photographs, by Dr. Arthur König, Jena. There are also tables for transformation of coördinates, and also for refraction corrections.

These two final volumes complete the series, the first of which was issued in 1928. The work reflects the highest credit upon those who outlined it and upon all those who added in carrying out the large project. It surely is one of the most significant contributions to the science of atronomy in this generation. The mechanical work too is most excellently done. The materials used in it are such as to give permanency of which a work of this character is highly worthy. Observatories and scientific libraries the world over which secure this complete set will be fortunate in its possession for many years to come.

Comet Z, by George Weston. (Methuen and Co., Ltd., London. 7/6.)

Judged by the title, this book would seem very appropriately to deserve a place among our book reviews. The critical astronomer, however, would at once be skeptical of its astronomical content, since such designation would be used only after twenty-six different comets had been seen in one year. No year is associated with this title which constitutes the first item in repect to which the author exercises the liberty accorded to writers of fiction.

Having mentioned the title, the astronomical bearing of the book is completely treated. The influence of this mythical comet is invoked for the purpose of casting a mysterious spell over the entire human race. The imaginary consequences of this spell are treated in some detail in a highly fanciful manner. In the end the disappearance of the comet is as sudden and unheralded as its appearance had

been. The spell is broken and humanity resumes its normal ways of living.

Anyone who wishes entertainment for an hour or two in a highly imaginative way, tracing a sequence of extremely improbable events, will find it in a perusal of this volume.

Dix Leçons d'Astronomie, by E. Esclangon. (Gauthier-Villars, 55 Quai des Grands-Augustins, Paris. 25 francs.)

In this volume the author introduces the general reader to the subject of astronomy by deliberately excluding from his presentations of it all abstractions and all points of view which are technical, thus leaving it always within the reach of everyone. After reviewing the extensive part this science has had in the past both in its philosophical and scientific aspects, the author points out its present problems and hints at their solution. Finally, he shows how astronomy, the most ancient of the sciences, has prepared and still prepares the way for the development of the other natural scinces, and how it continually discloses new horizons for the student.

All those who are interested in astronomy and who can intelligently read the French language will find this book a safe guide because it has been prepared by one eminently qualified for the task he has undertaken.

The Marvels of the Heavens (Il Cielo e le sue Meraviglie), by Pio Emanuelli. Ulrico Hoepli, Milan, 1934. Quarto, 9 x 12½ inches. 180 pages of descriptive text and 150 plates. Price, 130 lire (about $11).

This fine collection of reproductions of celestial photographs should be in the possession of every teacher of astronomy or lover of the science, as well as in every astronomical library. While fine collections of particular classes of celestial objects are available, and while some modern textbooks are well and representatively illustrated, no previous attempt, with the exception of "Der Neuentdeckte Himmel," Berlin 1930, by Robert Henseling and "Der Himmel im Bild," Stuttgart 1927, by Stuker, has been made to collect in one atlas representations covering all fields of modern astronomy since the appearance of *Die Himmelskunde* over thirty years ago, now quite out of date. This timely book thus forms a definite contribution to the bibliographical apparatus of modern astronomy. It should be particularly useful to the teacher who lacks extensive library facilities.

The 150 plates are well selected from the most recent photographs taken with large instruments, and comprise,—

The moon,	14 plates	Milky Way	17 plates
The sun,	38 plates	Star clusters,	5 plates
The planets,	9 plates	Diffuse nebulae,	25 plates
Comets and meteorites,	13 plates	Spirals,	15 plates
Observatories and telescopes,	14 plates		

The press work of the reproductions is almost uniformly of high excellence. Only one plate (the Trifid Nebula), whether from the long exposure time chosen or from faults in the reproduction process, appears inferior to other published photographs of this object. The large scale plates are made possible by the format of the book, and are very effective and pleasing to the eye.

While the descriptive text facing each photogravure is in Italian, the book will be just as valuable on its pictorial side to those entirely unfamiliar with that language. It is to be hoped that an English edition will eventually appear. With each description there is given a comprehensive bibliography of the object that should form a convenient body of reference for the more advanced student.

H. D. C.

Starry Pages, by W. A. Amiet, M.A. (Angus and Robertson, Ltd., 89 Castlereagh St., Sydney, Australia, 5s.) The above is the title of a book of 176 pages of reading matter, bearing the date 1934. It is divided into thirty-six chapters, quite distinct from one another, bound together only by a thread of astronomical thought which becomes quite slender at times, as, for instance, that part which holds the chapter entitled *Centenarians.* The author at the outset disclaims any intention of presenting original material. He has brought into a small volume the results of rather wide reading of recent writings. In this he has done a meritorious thing, as most persons do not have the time, patience, and ability to read understandingly the new scientific books which are coming from the press at such a rapid rate in our day. The author's style is fluent and captivating. Even though the reader may be familiar with the material of the book, his attention is held from beginning to end by the fresh and individual way in which the facts are presented. The chapters which are essentially reviews of the recent works of present day English writers are very well done and stimulate one's desire for more intimate acquaintance with the literature.

The volume can be highly recommended for those who desire to obtain quickly and easily an introduction to the most recent ideas current in scientific circles. It is, moreover, an indication of the activity in Australia along astronomical lines which is evident also through the work of amateur and professional societies there.

The Composition of the Stars, by Henry Norris Russell.

The above is the title of a pamphlet of thirty-one pages which gives in printed form the Halley Lecture delivered on June 1, 1933. It is very doubtful whether anyone else has made as thorough a study of this subject as has Professor Russell and consequently this may be considered as the most recent and most reliable information available. The reader will be amazed at the progress during the period of one century. As Professor Russell states, one hundred years ago it was believed that the question as to the composition of stars would forever remain unanswerable. All this has been changed through the application of the spectroscope to the question.

The pamphlet is issued by the Clarendon Press, Oxford, England, and may be purchased for seventy cents.

Publications Received.—The publishers of POPULAR ASTRONOMY hereby acknowledge the receipt of the following named publications and express their great appreciation of the courtesy shown on the part of those who have sent them.

The Enlargement of the Berlin-Babelsberg Observatory in the Years 1921-32, by P. Guthnick. Reprint.

New Zealand Astronomical Society, Circular No. 13, which contains estimates of magnitudes of variable stars based upon observations made from October, 1932, to March, 1933.

Contributions from the Mount Wilson Observatory—

No. 463. Investigations on Proper Motion, Eighteenth Paper, by Adriaan van Maanen.

No. 468. The Photographic Determination of Stellar Parallaxes with the 60- and 100-inch Reflectors. Thirteenth Series, by Adriaan van Maanen.

No. 471, Catalogue and Bibliography of Stars of Classes B and A whose Spectra have bright Hydrogen Lines, by Paul W. Merrill and Cora G. Burwell.

No. 472, Systematic Corrections to Magnitude and an Extension of the Polar Sequence, by Frederick H. Seares.

No. 473. The Distribution of Absolute Magnitudes among Stars of Spectral Types A, F, G, and K, as determined from Trigonometric Parallaxes, by Gustav Strömberg.

No. 474. Systematic Errors in Trigonometric Parallaxes as a Function of Right Ascension, by Adriaan van Maanen.

No. 475. Preliminary Report on the Investigation of the System of H.D. 198287-8, by William H. Christie.

No. 476. Photometry with the Schraffierkassette, by William H. Christie.

No. 477. Opacity Formulae and Stellar Line Intensities, by Henry Norris Russell.

No. 478. Measurements of the Radiation from Variable Stars, by Edison Pettit and Seth B. Nicholson.

No. 481. The Radial-Velocity Variations of V Ursae Minoris, R Sagittae, and V Vulpeculae, by Roscoe F. Sanford.

No. 482. The Radial-Velocity Variation of UU Cassiopeiae, by Roscoe F. Sanford.

No. 483. Approximate Spectroscopic Elements for AG Virginis, RW Coronae Borealis, and AK Herculis, by Roscoe F. Sanford.

No. 484. Spectroscopic Orbital Elements for the Eclipsing Variable CM Lacertae, by Roscoe F. Sanford.

No. 485. The Distribution of Extra-Galactic Nebulae, by Edwin Hubble.

No. 486. Photography of the Near Infra-Red Region of Stellar Spectra, by Paul W. Merrill.

Veröffentlichungen der Universitäts Sternwarte zu Berlin-Babelsberg:

Band VI, Heft 5, Neue Untersuchungen im Saturn-system, von Georg Struve.

Band IX, Heft 3, Zonenbeobachtungen der Anhaltsterne für die Wiederholung des A. G. Katalogs, von J. Stobbe.

Band IX, Heft 4, Die Langperiodischen Veränderlichen, von H. Thomas.

Band IX, Heft 5, Die Bedeckungsveränderlichen, von S. Gaposchkin.

Band X, Heft 1, Untersuchen über das Zodiakallicht, von C. Hoffmeister.

Band XI, Heft 1, Neue Untersuchungen über die Veränderlichen im Kugelsternhaufen Messier 3, von Th. Müller.

Kleinere, Nr. 12, Tafeln der Lichtgleichung, von R. Prager.

Publications of the Yerkes Observatory, Vol. VII, Part II, A Study of the Spectrum of 7 ϵ Aurigae, by Edwin B. Frost, Otto Struve, and C. T. Elvey.

Annals of Harvard College Observatory, Vol. 84, No. 8. The Spectral Changes of β Lyrae, by Antonia C. Maury.

Lick Observatory Bulletin:

No. 454. An Investigation of Color Excess in Galactic Star Clusters, by R. S. Zug.

No. 457. A Study of Hydrogen Emission in Stars of Class B0-B5, by Boris George Karpov.

No. 458. A Study of the Distribution of Extra-Galactic Nebulae based on Plates taken with the Crossley Reflector, by Nicholas U. Mayall.

Publications of the Dominion Astrophysical Observatory:

Vol. VI, No. 9. Spectrophotometric Studies of Wolf-Rayet Stars and Novae, by C. S. Beals.

Vol. VI, No. 10. The Radial Velocities of 477 Stars, by W. E. Harper.

Vol. VI, No. 11. The Spectroscopic Orbit of H.R. 8584, by W. E. Harper.